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THE MARINE REVIEW

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the Business of Transportation by Water.

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DECEMBER, 1916

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Fifty-One Who Did Not Die in Vain

"Black Friday's" Storm on Lake Erie Will Give New Impetus to Safety Movement—Greater Disaster Averted only Through Exercise of Disciplined Courage

IT IS to the mind and energy of Jasper H. Sheadle that the safety-first movement on lake steamships largely owes its impetus and among the many principles for which he fought, and it is not too much to say, died, this great cause stands pre-eminent. He was one of the little group of Americans who, working through the Lake Carriers' Association, broke down the old barriers of indifference and made safety-first a living reality on the Great Lakes, long before the TITANIC disaster stirred Europe into action, resulting in the famous London conference on safety at sea. He died in Syracuse, N. Y., on Sept. 22. Scarcely a month later, on Friday, Oct. 20, the effectiveness of his life's work was tested to the uttermost in a sudden storm that swept with unprecedented violence over Lake Erie, leaving a trail of wreckage and disaster in its wake.

Disciplined Courage in Action

Now that the events of "Black Friday" are sufficiently removed to permit of a proper perspective, it is evident that a disaster of much greater proportions was averted only by strict adherence to safety precautions that have become fundamental rules of action on the Great Lakes. All along the broad highway from Buffalo to Duluth steamers sought shelter and lives were saved at the expense of dispatch. This splendid exhibition of disciplined courage is all the more creditable when the tremendous pressure for tonnage is considered. There was every business reason to proceed in the teeth of the storm. That virtually the whole great fleet of over 1,000 vessels came to a dead stop, resulting in an almost incalculable loss in freight carried, and therefore in earnings, is proof positive that safety does stand first on the Great Lakes. Credit for this achievement properly belongs to the Lake Carriers' Association, in whose behalf Mr. Sheadle gave unstintingly of his time and energy.

But in spite of all that the safety movement on the lakes has accomplished, the end of the voyage is

not yet in sight. The record is clouded. As if defiant of the years of patient effort spent in building up a safety spirit, disaster stalked on the waters on "Black Friday". Four vessels and 51 men were lost. That the loss of these lives may not have been in vain, the work so powerfully promoted by J. H. Sheadle and his associates must go on until it is finished. And it will not be finished until fatal disasters are forever removed from the experience of lake navigation.

This ideal is not too high, nor is it impossible of achievement. A few days before "Black Friday" on Lake Erie a great safety congress, attended by over a thousand delegates from America's leading industries, convened in Detroit. At this meeting the full sweep of the safety-first movement was outlined. Industrial managers from all over the country pledged their faith to wage war on accidents until fatalities are eliminated from American factories. Is the American merchant marine any less vitally concerned in the results of accident prevention? Are its ideals placed any lower in the scale of achievement? The answer rings clear and unmistakable.

Facts Should be Faced Fearlessly

The disasters of Oct. 20 should double the determination to prevent casualties in the future. Causes should be probed deeply and fearlessly. The little schooner-barge D. L. FILER was 45 years old; BUTTERS had buffeted the waves for 34 years; COLGATE had seen 24 and MERIDA 23 years of service. These figures raise questions that should be settled definitely by responsible experts. MERIDA with her 3,329 gross tons had 1,700 indicated horsepower. RUTH, a successful Atlantic coast freighter of 3,102 tons, has only 1,200 horsepower; JEAN, another salt water vessel of 3,125 tons, has 1,300 horsepower. The advantage in this case patently lies with the lakes. But the whole question should be investigated and all possible or probable causes for disaster eventually eliminated.

Auxiliaries Built at Toledo Yard

Toledo Shipbuilding Co. Has Almost Completed its First Order for
Auxiliary Schooners—Detailed Description of These Vessels

By R. V. Sawhill

THE Toledo Ship Building Co., Toledo, O., has practically completed the last of six steel auxiliary schooners contracted for early in 1916 by the Standard Oil Co. of New Jersey. The boats are known as the Lite fleet, their names being STARLITE, MOONLITE, TWILITE, DAWNITE, SUNLITE and DAYLITE. STARLITE has already reached South America on her maiden voyage while MOONLITE and TWILITE are enroute to Buenos Aires. DAWNITE is loading at New

York. SUNLITE was launched Oct. 28 and will reach New York within a few days. Construction work is being rushed on DAYLITE and she will be towed to the coast and fitted with an oil-burning engine instead of being fully equipped at Toledo. This action is necessary in order to get the boat to salt water before ice blocks the Great Lakes. The vessels differ widely from the canal-size boats for salt water service with which lake builders are familiar and which they

have been turning out so successfully during the past year. In fact, the auxiliary schooner is still somewhat of a curiosity to many ocean builders.

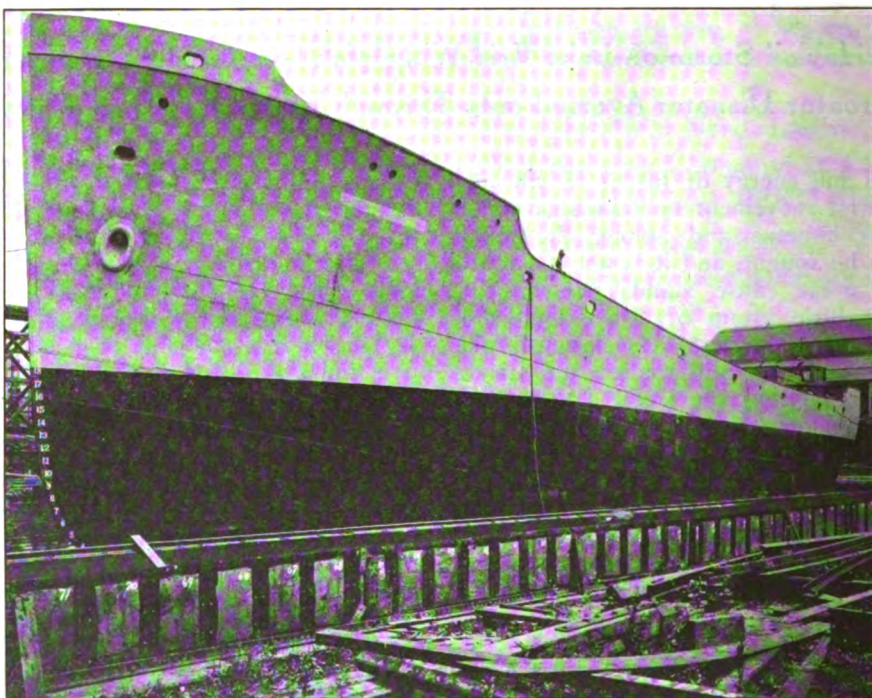
The sister ships of the Lite fleet are duplicates. Each vessel has an overall length of 261 feet and a length between perpendiculars of 252 feet. The molded breadth is 43 feet 6 inches. The molded depth midships is 23 feet 6 inches and the molded depth, lowest point, is 22 feet 8 inches. When loaded, the boats draw 18 feet 6 inches. Each boat is equipped with a Bolinder oil engine of 320 brake horsepower. Under power and sail, the vessels will make eight to nine knots when light and five to seven knots when loaded, depend-

ing upon the strength of the wind.

The original contract was placed with the Toledo Ship Building Co. by the Smith Shipping Co., New York. The boats, while still under construction, were purchased by the Standard Oil Co. of New Jersey. Some minor changes in design were made to fit the vessels for the service in which their new owner has placed them. They will be used to carry case oil to the River Plate, picking up miscellaneous cargo for the

to the cargo hold, each hatch being commanded by two cargo booms. A water bottom, 3 feet deep at the center line, extends from the collision bulkhead to the oil fuel tank. This design was changed in several of the boats just completed, to provide for storing 60 tons of fuel oil in the after end of the water bottom, the oil serving as ballast or in an emergency as fuel. The water bottom is divided by a center girder and transverse watertight floors into a

number of compartments. Each ship has four steel masts, fore, main, mizzen and spanker. The masts are each 112 feet long and are hollow. They extend to the tank top. The booms and gaffs are wood. The spanker mast carries off the exhaust from the engine. The donkey boiler is equipped with a portable 14-foot stack which discharges above the poop deck. As the donkey boiler is used only in port, the stack is taken down and carried in holders while the



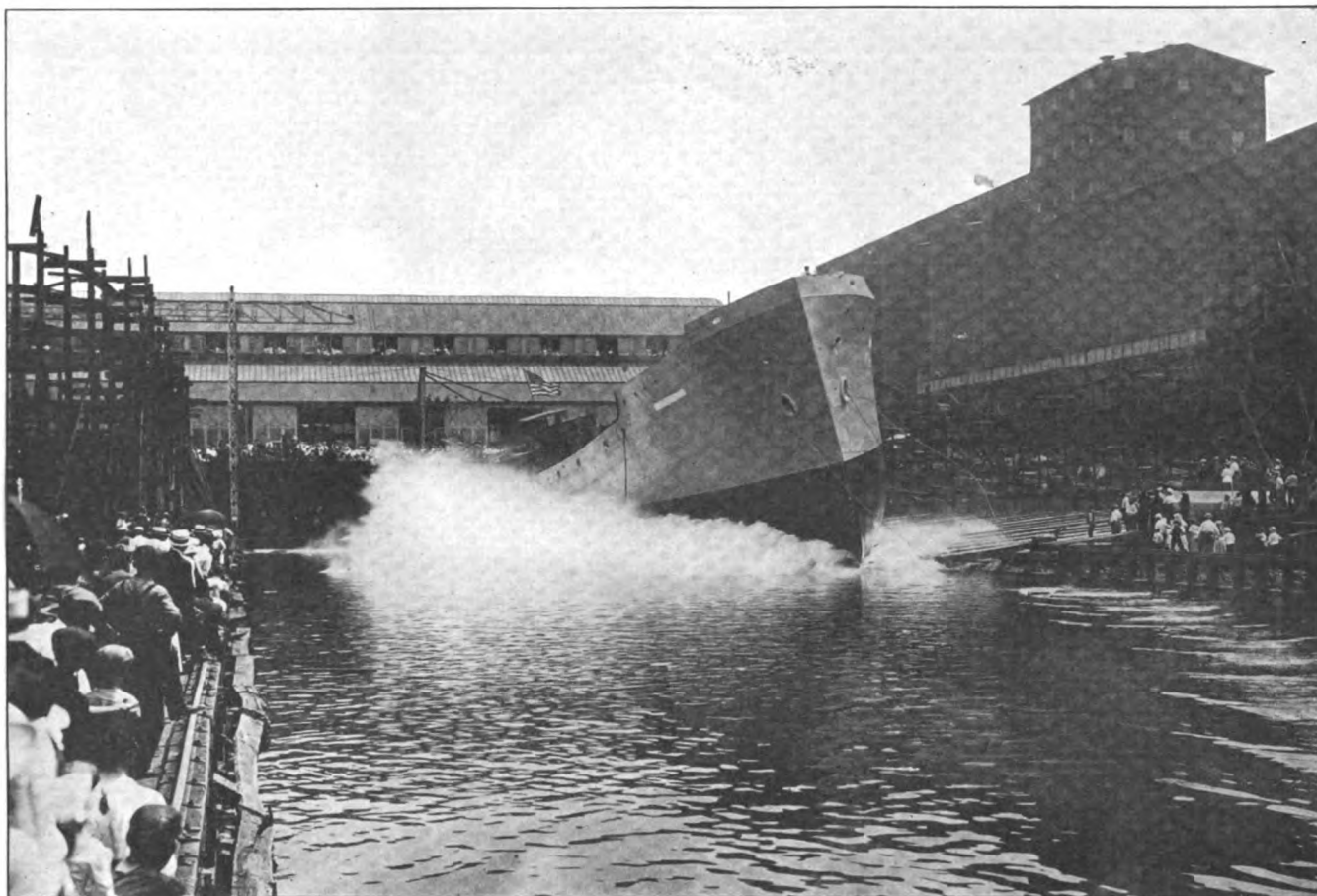
BOW-ON VIEW OF TWILITE BEFORE LAUNCHING

return voyage. The vessels have a deadweight capacity of 3,000 tons each and will carry about 75,000 cases of oil. Their gross tonnage is 1,950 and their net tonnage 1,600.

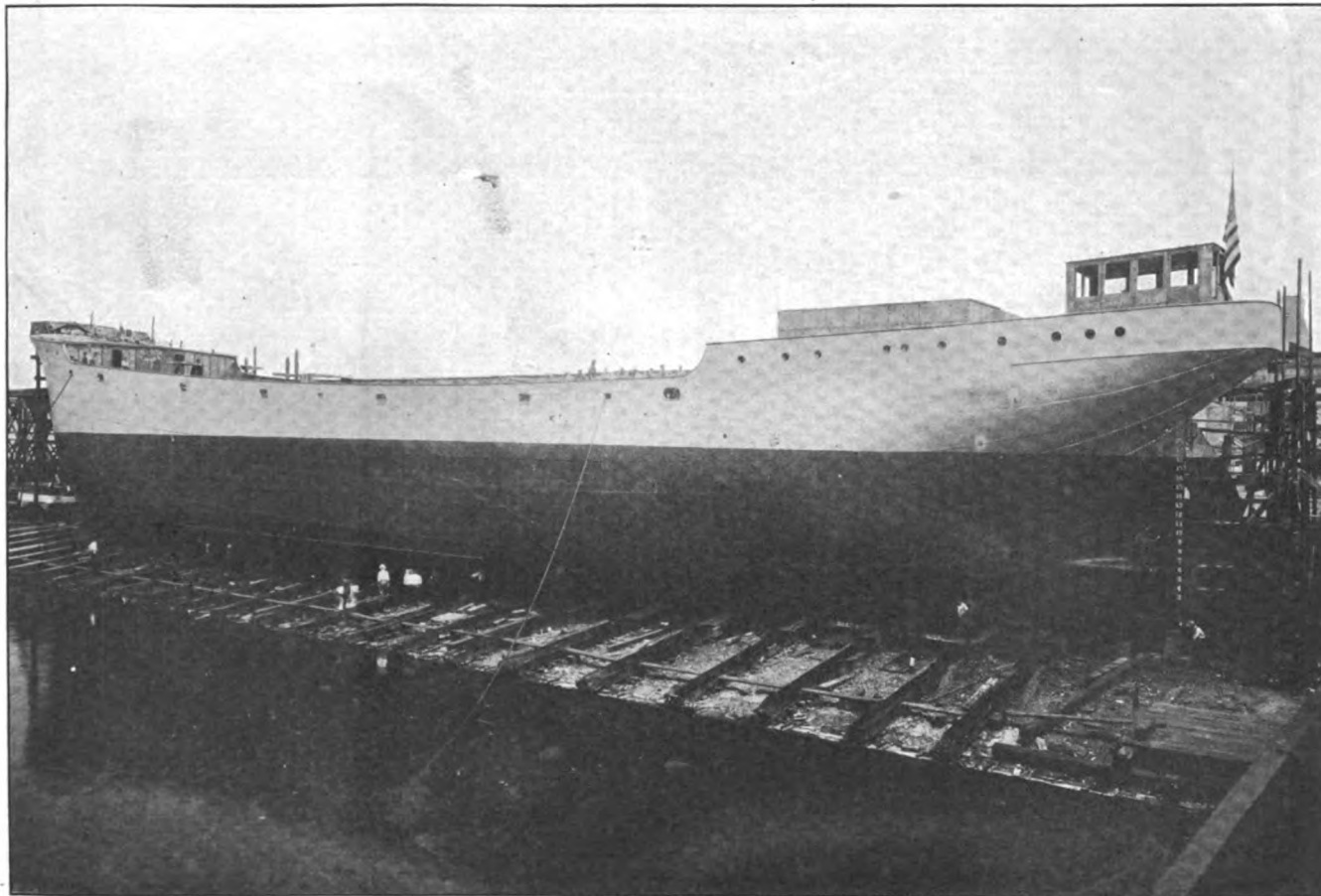
The vessels are fore and aft rig, single deck type with poop and fore-castle. They are built on the transverse system with deep stringer, web frames and wide-spaced hold beams. The propelling machinery is located aft, with the fuel oil tank forward of the engine space and extending from side to side. A donkey boiler is located on the upper deck in the forward end of the poop. The cargo hold extends from the collision bulkhead to the forward bulkhead of the oil fuel tank. There are three hatches

ship is under way. This arrangement was decided upon after considerable study. Originally it was planned to have both the engine and the boiler discharge through the mast but it was found that under such conditions the mast became heated to too high a temperature. That part of the mast between the tank top and the upper deck is perforated to aid in properly ventilating the hold.

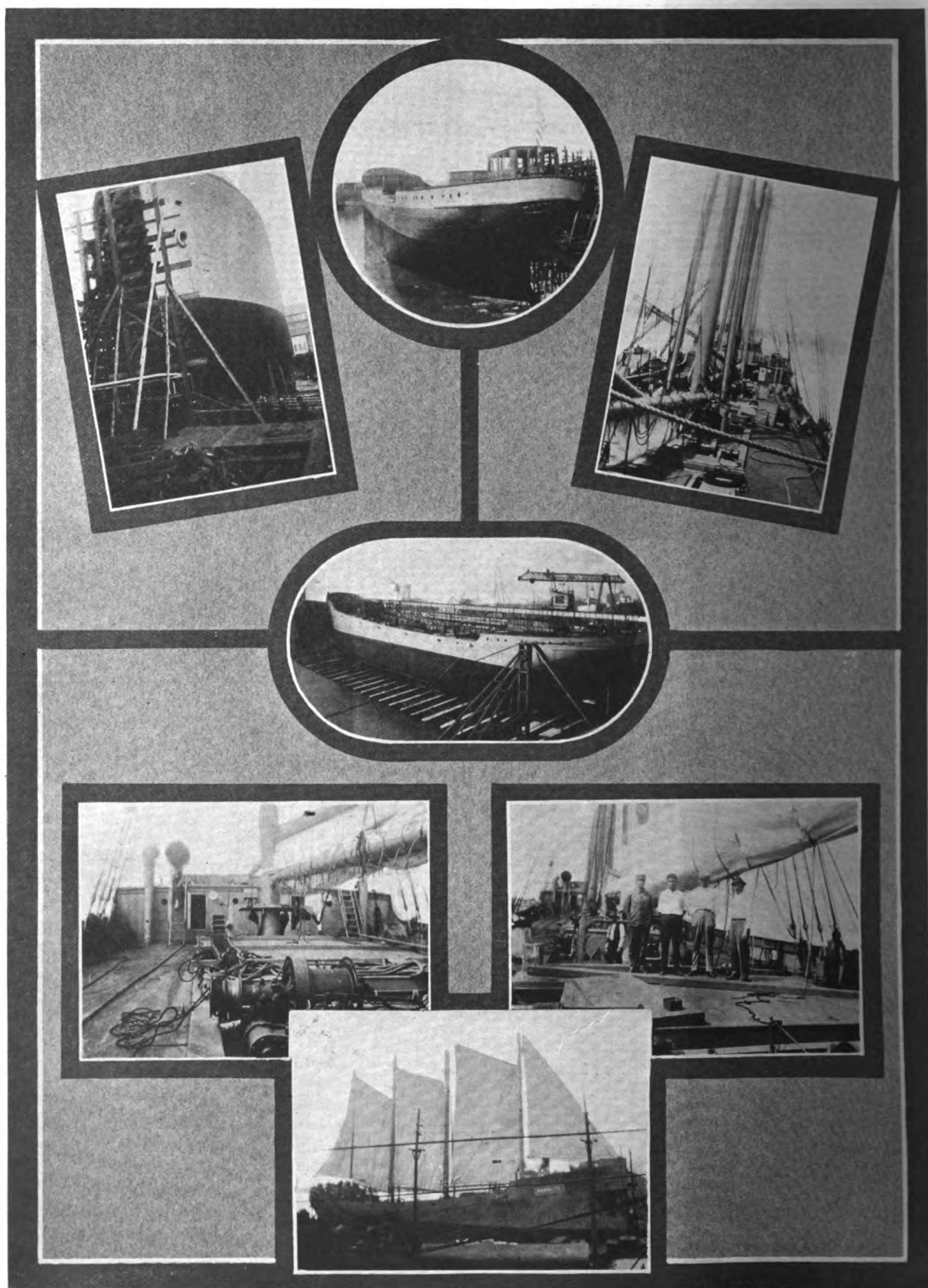
Quarters for the officers and engineers, together with the galley, storeroom, pantry, messrooms and saloon are in the poop. In the fore-castle, accommodations for the crew include sleeping quarters, hospital, messroom and washroom. The hospital is well equipped. In both the poop and the



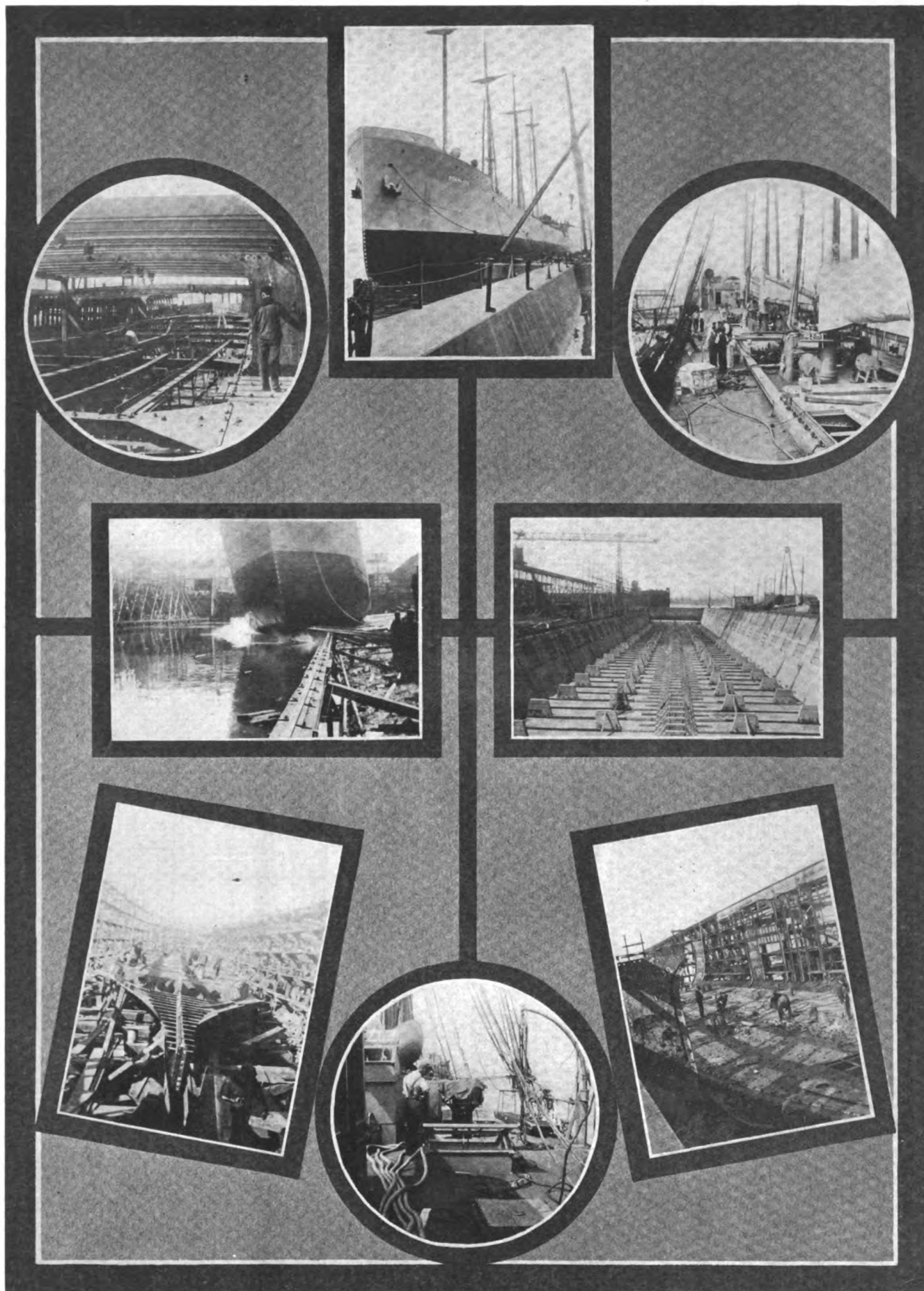
DAWNLITE ENTERING THE WATER AT TOLEDO



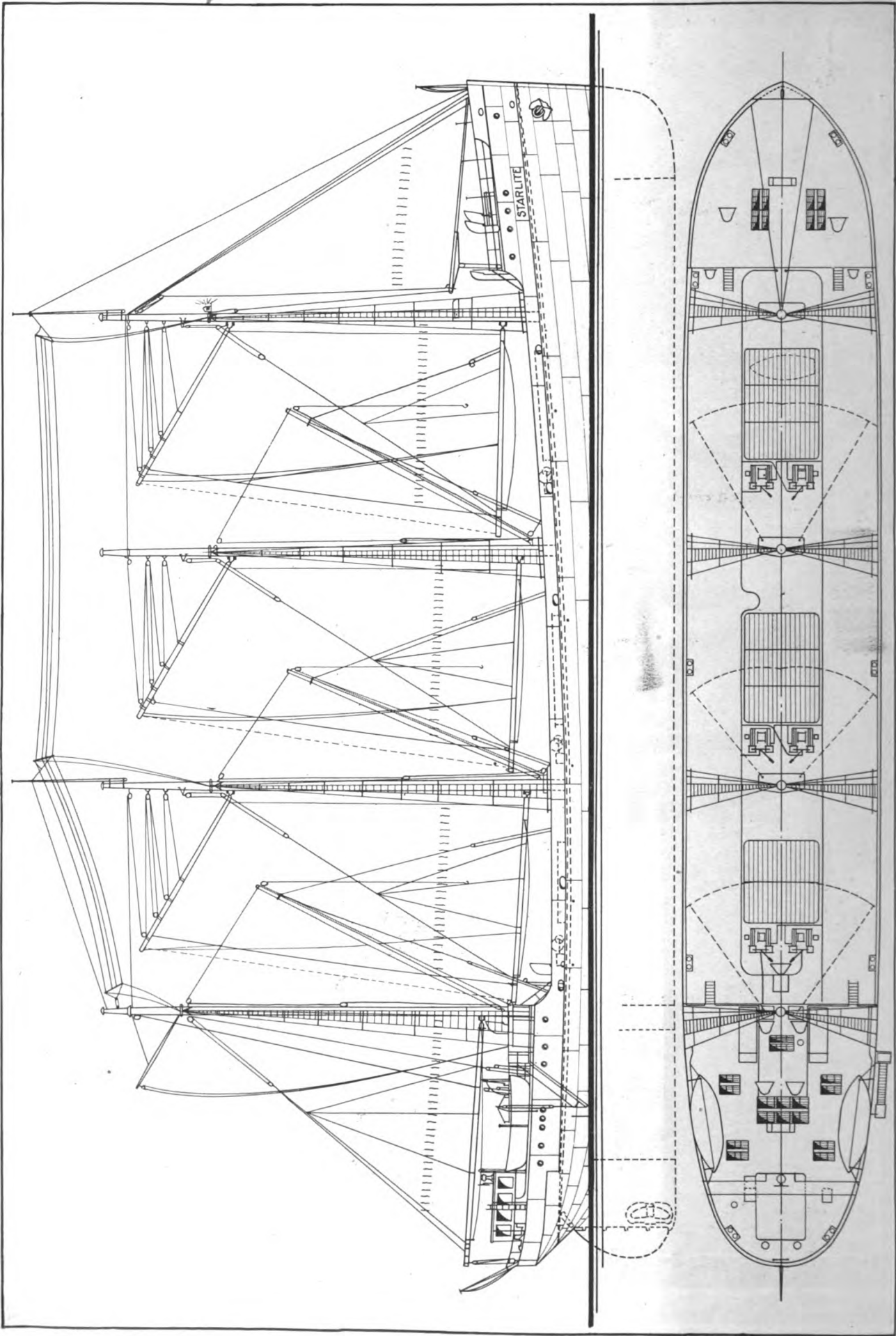
TWILITE READY FOR HER FIRST DIP



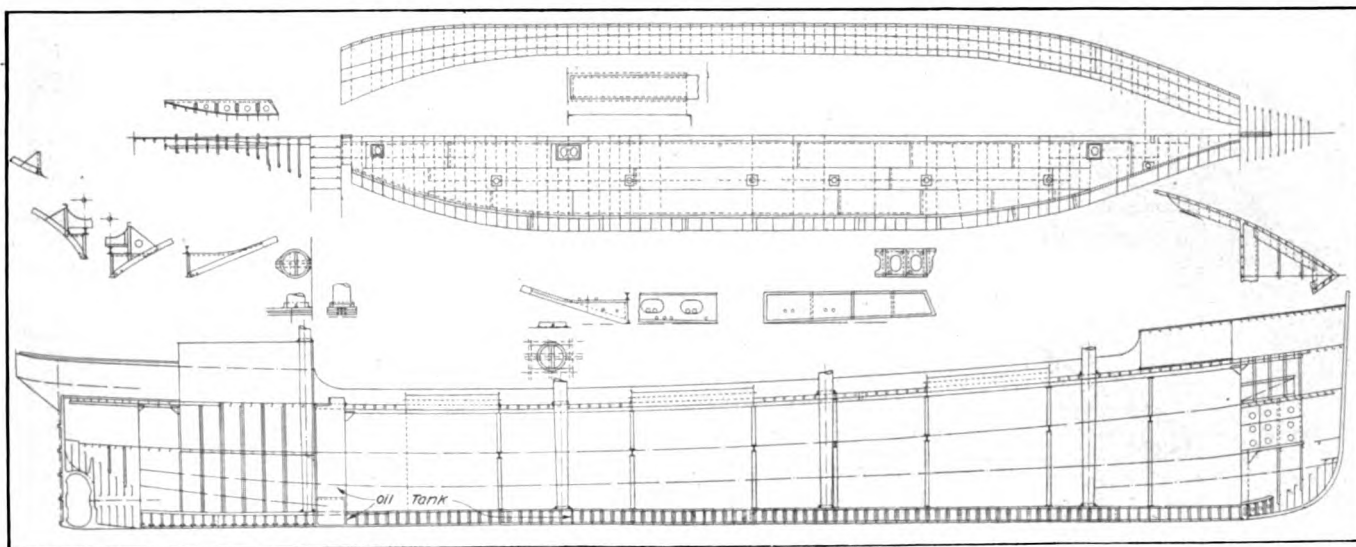
CHARACTERISTIC VIEWS OF AUXILIARY SCHOONERS AT TOLEDO



PROGRESSIVE STAGES BETWEEN KEEL-LAYING AND FITTING-OUT



OUTBOARD PROFILE OF AUXILIARY SCHOONER



INBOARD PROFILE, TANK TOP AND FRAMING

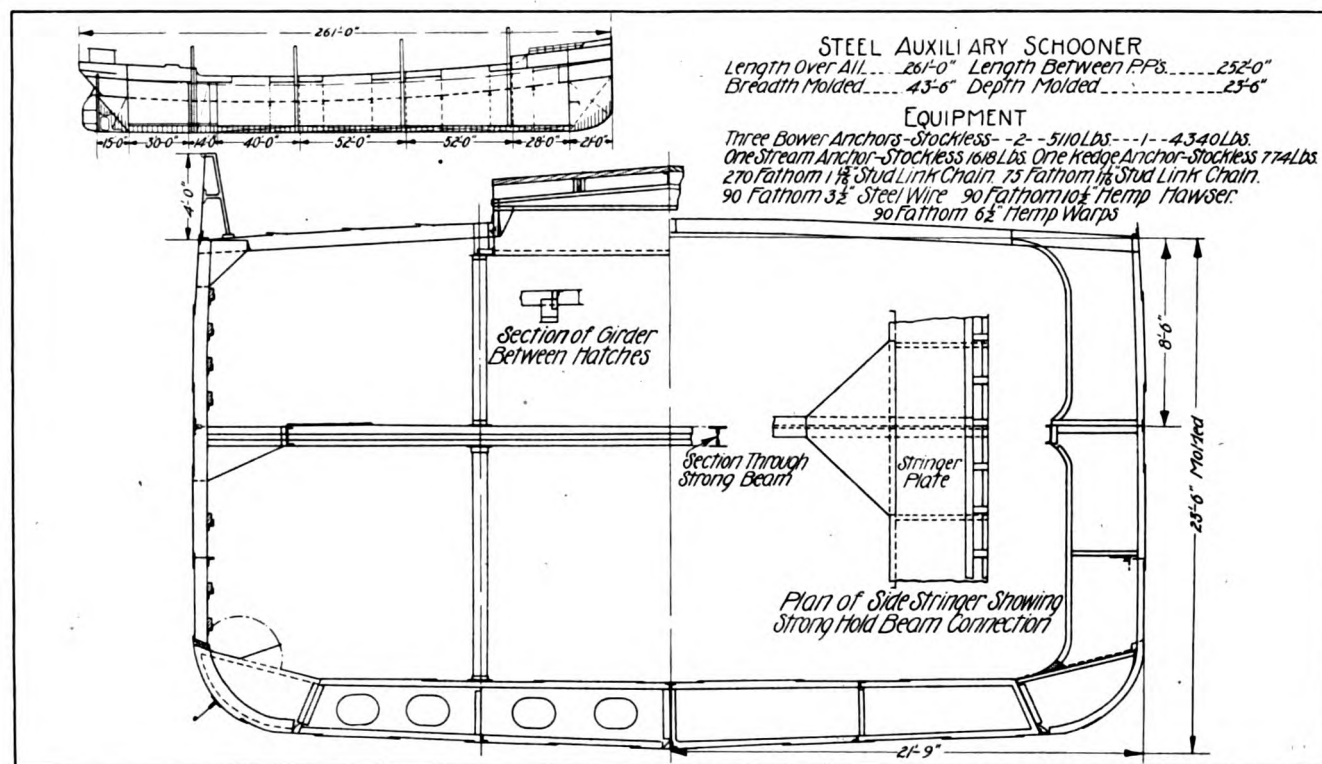
forecastle quarters, the decks are wood laid on steel beams. The upper deck from the break of the poop to the break of the forecastle, is steel. The windlass room, which is forward of the crew's quarters, also has a steel floor. The wheel house is steel and is 7 feet high from the top of the beams to the top of the carlins.

Two of the hatches are each 16 x 24 feet. The third hatch is located aft and is 16 x 18 feet. The hatch covers are yellow pine, 3 inches in thickness. They are built in sections, each section being clinched with three $\frac{5}{8}$ -inch bolts. The design provided that the coamings be unusually high.

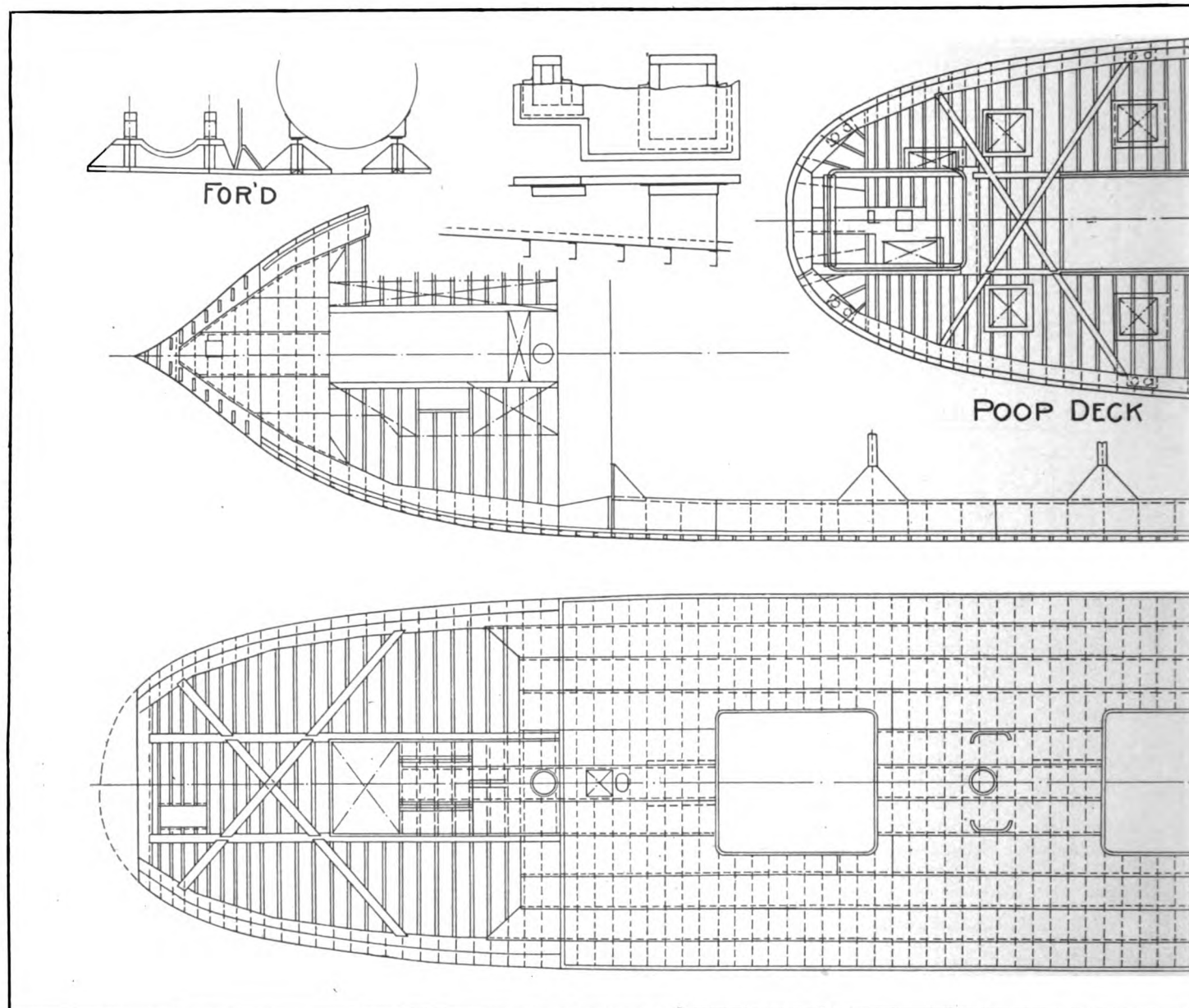
With all the sails set, the sail area is nearly 11,000 square feet. The booms on the fore, main and mizzen masts are 46 feet long, 11½ inches in diameter at the outer end, 14 inches in diameter at a point 16 feet from the outer end and 10½ inches in diameter at the heel. The spanker boom is 54 feet long, 12 inches in diameter at the outer end, 14 inches in diameter at a point 18 feet from the outer end and 11 inches in diameter at the heel. The jib boom is 42 feet long, 6½ inches in diameter at the outer end, 7½ inches in diameter at a point 16 feet from the outer end and 5 inches in diameter at the heel. The fore, main and mizzen

masts have gaffs 40 feet in length, 10 inches in diameter at the outer end, 12 inches in diameter at a point 16 feet from the outer end and 10 inches in diameter at the heel. The six derrick booms are carried on the main, mizzen and spanker masts, two booms to a mast. These booms are 60 feet long, two being 16 inches in diameter in the middle and 10 inches in diameter at the ends, and four being 15 inches in diameter at the middle and 10 inches in diameter at the end. These booms will carry a load of five and three tons respectively.

The engine is of the Bolinder, oil-burning, 4-cylinder, 2-cycle, direct re-



DETAILS OF MIDSHIP SECTION



COMPLETE DECK PLANS OF NEW TYPE OF AUXILIARY SCHOONER BUILT AT

versible type. It is built by the Bolinders Co., Stockholm. The American office of this company is at 50 Church street, New York. It will develop 320 brake horsepower. The ignition is of the hot bulb variety. The engine operates on heavy crude oil, which is stored in a fuel oil tank directly forward of the engine room. This tank will hold 38,000 gallons of fuel oil, giving the schooner a cruising radius of 9,000 miles. The newer vessels carry 60 tons or 16,000 gallons additional of oil in the after end of the water bottom.

The main fuel tank is divided into two compartments and the fuel may be drawn from either or both compartments at the same time. The tank is filled from the upper deck, 6-inch elbows being bolted to the deck on metal gaskets. Wrought iron vent pipes 6 inches in diameter extend

from the tank to a height 7 feet above the poop deck. In addition to a small storage tank for the fuel oil, eight 60-gallon tanks are placed in the engine room for carrying lubricating oil.

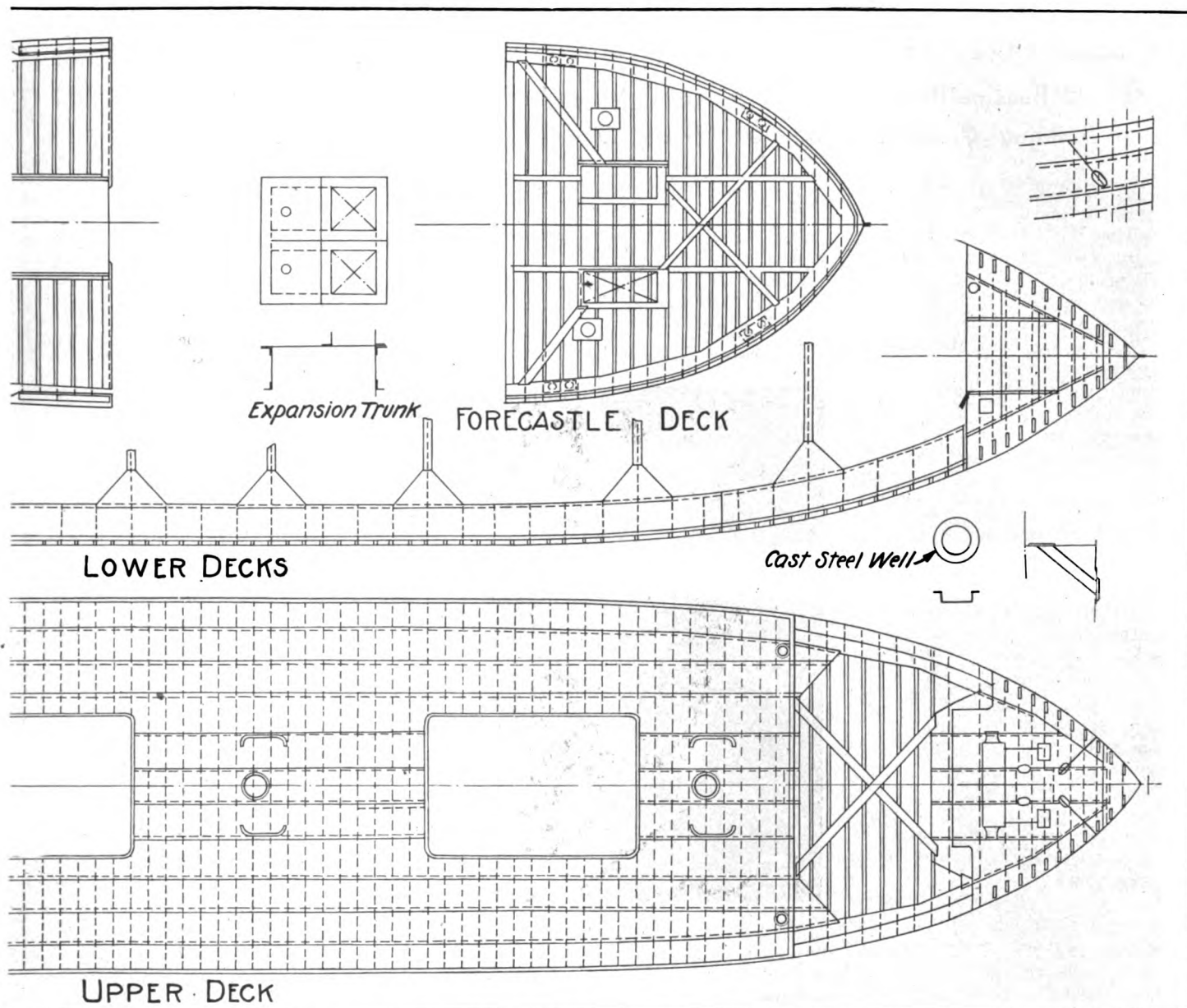
Scotch Donkey Boiler

The donkey boiler is of the Scotch marine type and is designed for a working pressure of 150 pounds per square inch. It will develop about 160 horsepower. The boiler is 8 feet in diameter and 9 feet long and has 38-inch Morrison interchangeable furnace with a heating surface of 576 square feet. The flooring around the boiler, as well as the engine, is $\frac{1}{4}$ -inch checkered steel plate. Sections of the flooring can be lifted when it is necessary to get at the piping.

The capstan, steering engine, six

cargo booms and six winches are all steam driven. The capstan, which was furnished by the Hyde Windlass Co., is fitted on the upper deck in the forecastle. It is provided with two gypsy ends for warping. The steering engine is of the combined hand and steam, right and left hand screw type. It is located in the wheel house on the poop deck. The six steam cargo winches are of the single-drum type, provided with a single gypsy, right and left handed. Each winch, which is capable of handling three tons on a single whip, operates at 80 pounds pressure.

Electricity for lighting purposes is furnished by a 6-kilowatt generator, fitted in the engine room. The generators for the entire fleet were furnished by Engberg's Electric & Mechanical Works, St. Joseph, Mich. A central switchboard is installed, sep-



TOLEDO, O., FOR THE SOUTH AMERICAN TRADE

arate circuits being provided for the different parts of the ship. In addition to the usual lights in the cabins, engine and boiler rooms and hold, outside lights are fitted on the corners of the wheel house and at the after end of the forecastle and the forward end of the poop. The side lights and masthead lights are fitted both for electricity and oil.

Each vessel is equipped with a surface condenser which has a capacity of 5,000 pounds of water per hour. The pumping equipment includes a horizontal duplex circulating pump for salt water service and a horizontal duplex feed pump for supplying the boiler from the hot well tank or the feed water tank. The hot well tank, which receives the water from the condenser, is equipped with the necessary piping for carrying the overflow to the feed water tank. The fresh water

tanks include one of 1,200-gallon capacity, and two of 1,400-gallon capacity. Two salt water tanks, each of 100-gallon capacity, also are provided.

Cast Iron Propeller

The propeller is cast iron and is 78 $\frac{3}{4}$ inches in diameter and 55-inch pitch. It is of the three-blade type.

The Toledo Ship Building Co. designed most of the fittings for these vessels and in several instances developed fittings of an original character. For instance, it was found that the ordinary hoops could not be used for holding the sails and a rail-shaped sail track with a cast steel hank was designed. All of the boom castings were specially designed. The arrangement of the rigging also required careful attention as there is an unusually large number of standing and running

lines in the Lite fleet. These vessels have all the sail ropes of a schooner and all the cargo booms ropes of a steamer.

Each vessel carries two metal lifeboats, 22 feet long, and an 18-foot wooden power dory. Each lifeboat will carry 20 men. The dories are driven by 7-horsepower Gray 2-cycle engines. The second lifeboat was added by the Standard Oil Co. of New Jersey, which also made several other changes in the original plans. The most important change was the provision for a flying bridge across the top of the wheel house. This bridge extends to the ship's sides. The storerooms were rearranged and the location of the ice box changed. The latter alteration has resulted in reducing the temperature in the main storeroom so that a temperature of 40 degrees Fahr. is obtainable.

Death of James C. Wallace

He Became President of the American Ship Building Co. When Only 39 Years Old

JAMES CHASE WALLACE, former president of the American Ship Building Co., died Oct. 31, at his home, Lakewood, O., after an illness of several months. He was a veteran traveler and was taken ill while starting on a trip to Alaska early in the summer.

Mr. Wallace was born May 23, 1865, a son of the late Robert Wallace, one of Cleveland's pioneer ship builders. The younger Wallace followed in his father's footsteps and devoted his life to building and operating ships. With his father he organized the Cleveland Ship Building Co., and afterward effected the organization of the American Ship Building Co.

In 1886 he married Miss Elizabeth C. LaMarche, who survives with two children. He also leaves two brothers, R. B. Wallace and L. H. Wallace. He was a director in the American Ship Building Co., Pioneer Steamship Co., Kinney Steamship Co., Valley Steamship Co., Superior Savings & Trust Co., Peoples Savings & Trust Co., Western Reserve Woolen Mills, A. B. Smythe Co., American Board of Lloyds Register of London, and a number of Cleveland clubs.

In 1881 he began a three years' machinist apprenticeship. In 1884 he entered the employ of the Globe Iron Works, Cleveland, first in the machine shops, then in the ship yard and later in the drafting room. For a short time he sailed on the lake steamer ONOKO as assistant engineer. When the Cleveland Ship Building Co. was formed in 1887, he was placed in charge of the drafting room. In 1890 he was named assistant superintendent of the company, and in 1893 he was chosen vice president and general manager. When the American Ship Building Co. was formed in 1899, taking over the plant of the Cleveland Ship Building Co., Mr. Wallace was named vice president and general manager of the new concern. This position he held until early in October, 1904, when he was chosen president of the American Ship Building Co. in succession to A. B. Wolvin. Mr. Wallace had not yet attained the age of 39 years when given the executive head of this large concern and he had worked his way up through every department along constructive lines.

During the years of his presidency, he struck out in ship building along bold lines, and many of the improvements effected in design and construction of lake vessels in the past dozen years were attributed to Mr. Wallace. He resigned the presidency Sept. 23, 1914. Edward

Smith, since deceased, was elected to succeed him.

Mr. Wallace was a most energetic and capable chief executive. He held the confidence of his employees and business associates to a marked degree and was known personally almost to every man of them.



JAMES C. WALLACE

Last Cruise of Walkure

The American steamer REPUBLIC, formerly the German steamer WALKURE, sailed from Portland, Ore., recently with the largest lumber cargo ever shipped from the Columbia river to the west coast of South America—more than 3,000,000 feet. A victim of the European war, REPUBLIC is one of the most interesting craft that has been on the coast for many a day. Her story reads like a work of fiction. With Hamburg as her home port, WALKURE, in the summer of 1914, was in the south seas trade. It happened that in August she was loading pearl shell at a small island about 50 miles from the French island of Tahiti. ZELEE put to sea, found WALKURE, overhauled her and announced to the astonished German that his ship was a prize of war. The captain of WALKURE thought the matter was a joke and swore that someone would suffer for the high-handed act. He had not heard of a war and refused to be convinced that hostilities had begun. He was forced to let his

vessel become a captive, however, and so ZELEE took her back to Papeete after what was undoubtedly the first naval engagement, if it can be called that, of the present titanic struggle.

WALKURE was anchored in Papeete harbor. Next month, Sept. 22, the German cruisers SCHARNHORST and GNEISENAU appeared and began a bombardment. WALKURE, mistaken by the attackers for a French merchantman, was sunk by the fire of the German guns and her captain stood helplessly by and saw his ship sunk by fire from vessels of his own country. A year passed by and WALKURE lay half submerged in Papeete harbor. Demand for tonnage raised hopes of salvage, and she was purchased by John A. Hooper, who later raised her. She was finally floated January 11, 1916. Eleven days later she was given American registry and renamed REPUBLIC. REPUBLIC was built at Sunderland, England, in 1907, by William Doxford & Sons. She is 349.1 feet long, has a beam of 49 feet and a 23.9-foot draft.

Lake Erie Ore Receipts

Receipts of ore at Lake Erie ports during October totaled 6,864,645 gross tons, compared with 5,741,176 tons received in October, 1915. The following table shows the amount of ore received at the different Lake Erie ports:

Port.	Gross tons.
Buffalo	984,208
Erie	285,111
Conneaut	1,150,023
Ashtabula	1,488,120
Fairport	298,970
Cleveland	1,394,605
Lorain	702,105
Huron	193,206
Toledo	320,094
Detroit	48,203
Total	6,864,645

Ore Shipments

Ore shipments during October were 9,116,196 gross tons, a gain of 1,969,323 tons over the record movement of October, 1915, when 7,146,873 tons were shipped. This movement is heavier than was expected, and in spite of the delays brought about by the shortage of cars, the October figures show a decrease of only 478,196 tons from the September shipments. The movement to Nov. 1 aggregated 57,932,846 tons, compared with 41,816,439 tons shipped to Nov. 1, 1915. The 1916 figures as of Nov. 1 show an increase of 8,862,268 tons over the total movement for the season of 1913, the record year in the ore trade, when 49,979,478 tons were brought down. It is certain, therefore, that the total season's shipments for 1916 will be between 63,000,000 and 64,000,000 tons. To ac-

comply this the fleet will have to move approximately 5,067,000 tons from Nov. 1 to the close of the season. Owing to the light grain movement during that period, the bulk of the steel vessels carried iron ore during the first half of November. Shippers are confident that all the ore that will be needed will be brought down.

Following are the shipments by ports for October and up to Nov. 1, 1916, with comparative data for 1915:

	October, 1915.	October, 1916.
Escanaba	928,399	876,488
Marquette	522,671	519,806
Ashland	866,170	1,218,134
Superior	1,351,893	1,732,865
Duluth	2,301,352	3,298,314
Two Harbors	1,176,388	1,470,589
	7,146,873	9,116,196
1916 increase		1,969,323
	To Nov. 1, 1915.	To Nov. 1, 1916.
Escanaba	4,940,081	6,507,482
Marquette	2,836,203	3,546,651
Ashland	4,695,752	7,269,846
Superior	7,348,916	11,493,831
Duluth	14,108,571	19,472,473
Two Harbors	7,886,916	9,642,563
	41,816,439	57,932,846
1916 increase		16,116,407

Soo Canal Report

The movement of freight through the Soo canals during October aggregated 11,919,012 net tons, as against 12,906,524 tons which passed through during September. The total movement for the season up to Nov. 1 was 80,374,509 net tons, a gain of 20,433,055 tons over the figures for the corresponding period in 1915, when 59,941,454 tons were moved. The Nov. 1 total for the present season also exceeds that for Nov. 1, 1913, the year of maximum freight movement on the Great Lakes. The season's freight movement in 1913 up to Nov. 1 amounted to 70,992,568 net tons.

Following is the summary for Nov. 1, 1916, with comparative figures for 1915:

EAST BOUND.

	To Nov. 1, 1916.	To Nov. 1, 1915.
Copper, net tons.....	101,515	117,651
Grain, oth. than wheat, bushels	68,179,438	35,195,203
Flour, barrels	8,202,139	6,664,067
Iron ore, net tons.....	56,288,748	40,638,322
Pig iron, net tons.....	12,050	15,640
Lumber M. ft. B. M. .	302,573	416,352
Wheat, bushels	175,180,717	131,926,082
Uncl. frgt., net tons	280,993	267,837
Passengers, number ..	27,645	22,262

WEST BOUND

Coal, anthracite, net tons	1,888,831	1,708,922
Coal, bituminous, net tons	12,487,895	9,749,346
Flour, barrels	13,321	100
Grain, bushels	6,695	31,623
Mfld. iron, net tons..	133,726	158,515
Iron ore		1,500
Salt, barrels	683,117	603,586
Uncl. frgt., net tons	1,032,260	1,093,133
Passengers, number ..	24,283	24,331

SUMMARY OF TOTAL MOVEMENT.

East bound, net tons..	64,599,288	47,139,174
West bound, net tons.	15,775,221	12,802,280
Total	80,374,509	59,941,454
Vessel passages	22,098	18,138
Net registered tonnage.	61,097,204	47,862,258

Origin of Marine Insurance

Was Known as "Bottomry" and Dates Back to Early Greeks—First Practiced in England by Germans

FROM time immemorial every phase of sea affairs has possessed a distinct fascination, and none is more interesting than the history of early marine insurance. From the times of the Greeks and Romans a system of insurance has been in vogue, but the first explicit statement in writing regarding the matter is found in an edict of Justin Martyr, of the year 533 A. D. He decreed 12 per cent to be the lawful amount of profit for the insurance of goods upon land, and 20 per cent to marine insurers on account of the additional risks entailed. This primitive system of insurance was termed "bottomry", and by it the ship was virtually mortgaged. If the ship was lost at sea, the lender lost the money advanced on her; but if she arrived safely, he not only recovered the loan, but also the premium previously agreed upon.

In Great Britain the first marine insurers were the merchants of the Steelyard, who came from Germany in the reign of Edward IV. They settled in London, built houses for themselves, and became the representatives of the Hanseatic League. They were a quaint company, affecting a monastic-like austerity, abstaining from marriage, and holding no conversation with the opposite sex. Their premises were closed at a certain hour at night, and opened in the morning according to the season; while any deviation from their rigid rules was met by instant expulsion from their body. It was their custom to elect a "chief" annually, to rule over a council of 11 chosen from their ranks, and for this purpose a ceremony was held every New Year's eve.

In course of time these curious folk grew wealthy, for not only did they hold a monopoly of marine insurance, but they also enjoyed certain privileges in the matter of trading, which had been granted to them by the early English kings in return for funds for the carrying on of wars. Such favors bestowed upon foreigners roused the ire of Englishmen, and again and again this resentment manifested itself in repeated attacks by the London populace upon the Germans' warehouses. In the year 1597, however, public resentment grew so strong that an act was passed ordering all foreigners to leave the country on pain of heavy penalties.

By way of reprisals, the cities of the Hanseatic League placed restrictions upon British imports. "Good Queen Bess" had to be obeyed, and the Steelyard men went back to their native land. Their warehouses, in which they had transacted their banking, shipping, and marine insurance, stood until 1863.

When the Jews, after a period of persecution, fled from England, their places as financiers were taken by the Lombards, who consisted of merchants from Genoa, Florence and Venice. These people quickly settled in London, and did a thriving business as bankers, money-lenders, and insurers, leaving the name of Lombard street to perpetuate their fame. Of an exceedingly active and pushing character, they originated an agency at Inverness, and one of their projects was to build what they termed a "marine establishment". So fruitful did their business become that, like their German predecessors, they soon possessed themselves of much of the country's trade, and like them they paid the penalty, being obliged to return to their Italian homes forever.

With their departure the English people took up the matter of insuring ships, and an act of parliament was passed to facilitate matters. A board of insurance was formed, consisting of merchants and lawyers, which had for its aim the amicable settling of all disputes, but its meetings were few and far between, and gradually the whole system fell into sad disrepute. In the first instance, the first marine insurance agents were public notaries and brokers, while in 1602 a man named Candler applied for a patent to enable him to have the sole right of marine insurance. This application roused the indignation of the people in whose hands the insurance of ships had fallen, and it was with the purpose of appeasing their wrath that a "council of insurance" was soon afterwards formed. This was composed chiefly of those who had urged its formation, and in consequence did very little to bring about what Candler and others had agitated for.

Practically all our knowledge of these old insurance companies is derived from a work commonly known as the *Guidon*, issued at Rouen between 1590 and 1600. In all probability it was the production of many hands. From it one may obtain a good idea of early marine insurance,

as well as much valuable information regarding the various rules to which all insurers and insurance companies had to submit. For instance, all agreements had to be made in writing, from the fact that misunderstandings had frequently arisen in the past from the method of insuring a ship verbally. Consequently the latter method was declared illegal and non-binding. When an insurance had been agreed upon, it had to be signed in the presence of a registrar and enrolled as a public act, while without the stipulated registrar's sanction all insurance bargains were null and void. The registrar was required to be a man of fair education, strict sobriety and of "good repute"; he was further required to live in a populous part of the town, and place above his doorway a sign with the words "Office of Insurance". For his services in conducting the completion of the bargain he was to receive the "half of a quarter per cent for every hundred livres", and so on, rising in value according to a fixed scale.

Insurance Against Pirates

The registrar was obliged to keep in his office a box, into which those who obtained policies were forced to put, over and above the "half of a quarter per cent" paid for the insurance policy, a fixed sum, according to the extent of their transactions. The money derived by this means was utilized in part for the benefit of the poor, and in part for the maintenance of ship-wrecked mariners. Outside the registrar's door was another box for the reception of "God's pence", a toll which was used for the ransoming of travelers and seamen captured by pirates.

At the time of the Crusades it was no unusual thing for travelers to insure their lives against capture; and the insurers had to pay whatever ransom might be demanded for their release. Those, however, who were too poor to effect insurances of this description were perforce obliged to depend upon the money placed in the boxes for the reception of "God's pence".

By the end of the 16th century insurance companies had been instituted all over England; vessels were insured for five months when their voyages were to Flanders, Portugal and Norway; for 12 months when the ship sailed to the coasts of Italy, the Azores, Peru, Brazil or the Indies; and notification of loss was received for the former until the end of three months, while six and even as much as 12 months were permitted for the latter. When these stipulated times had elapsed no claim could be ad-

mitted, not under any circumstances.

The earliest English policy extant dates back to 1613, and was unearthed in the Bodleian library, Oxford. A few extracts from so interesting and unique a document may not be altogether without value. It commences:

In the name of God, Amen! Be it known unto all men by these presents that Morris, Abbot and Devereux Wogan of London Marchants doe make assurance and cause themselves and everye of them to be assured lost or not lost frome London to Zante Petrasse and Saphalonia or any of them upon woollen and linnen cloth, leade kersies, iron and any other goodes and merchandize heretofore laden aboarde the good ship called the tiger of London (whereof Thomas Crowder is master under God in this present voyedge) of the burthen of 200 touns or thereabouts, etc.

At the period that this policy was taken out, little can be learned of the court of insurance, but in the reign of Charles II, the king's bench on several occasions came into conflict with this insurance court; while gradually the disputes affecting insurance were referred to the ordinary courts of law, which now settle all such matters.

In the 18th century marine insurance was, if anything, more than ever a paying concern. As a means of showing to what extent marine and other insurances took hold on the British public, however, the following list bears eloquent testimony. The period is that of the notorious South Sea Bubble, and the list runs—"insurance for insuring and increasing children's fortunes"; "insurance from death by drinking Geneva"; "insurance from lying"; "insurance from housebreakers"; "rum insurance"; "insurance from highwaymen". These are but a few of the absurd schemes of insurance foisted upon the public when marine insurance was in its youth.

Launch 37,000 Ton Vessel

The quadruple turbine liner *PARIS*, of the French Trans-Atlantic Steamship Co., was launched recently at St. Nazaire, France. She is the largest steamship ever constructed in any French yard and will go into the service between Havre and New York.

PARIS has a displacement of 37,000 tons and has 45,000 horsepower. She will be registered at 25,500 gross tons. She is 639 feet long, with a beam of 84 feet, a depth of hold of 59 feet, and a draft of 40 feet. She will accommodate 3,000 passengers of all classes.

PARIS will have three big funnels, two masts, double bottoms, and watertight compartments running through the entire length of the vessel. Her hull is divided by 14 bulkheads. She has nine decks, including a shelter deck, and two

promenade decks, which run the full length of the ship. She will have accommodations for 485 first, 476 second, 920 third class, and 1,118 steerage passengers. The cabins and saloons are decorated on the same lines as *FRANCE*, which came from Havre to New York in 1912. It is not expected that *PARIS* will be ready before 1917.

Commercial Boat to Be Private Yacht

The steamer *UNITED STATES*, formerly owned by the Indiana Transportation Co., has been purchased from the Crosby Transportation Co., Chicago, by Col. E. H. R. Green, of New York, and the boat has made a record trip from Milwaukee to her new home. The boat was sold, according to report, for \$250,000. The sale was negotiated by the Chicago Steamboat Exchange, Chicago.

The steamer *UNITED STATES* was built by the Manitowoc Dry Dock & Shipbuilding Co. in 1909, and she was designed so that should the Great Lakes to the Gulf Waterway ever materialize into reality, she would be ready for such service. She is 214 feet long and has a beam of 40 feet. Her speed is 18 miles an hour. She made the trip of 2,800 miles from Milwaukee to New York, actual running time, in 11 days.

In her trip to the coast she was commanded by Capt. Frank Dorrity, of Milwaukee, with J. S. Sauer, of Chicago, chief engineer. The boat left Milwaukee, Thursday, Oct. 12, and arrived at Ogdensburg Monday, Oct. 16. She laid there sufficient time to put on ample fuel to take her to New York. She made only short stops enroute from Ogdensburg, and while she encountered heavy weather on Lake Erie and Lake Ontario, as well as at sea, she arrived in New York 12 days after the commencement of the voyage. She is now at the Todd shipyards where extensive alterations are being made to make her the most spacious yacht on fresh or salt water.

Submarine Launched

The United States submarine L-6, the first underwater boat to be built in southern California, was launched recently at the yards of the California Shipbuilding Co., Long Beach, Cal. After leaving the ways it struck a mud-bank and was held there at an angle of 45 degrees until pulled off by tugs, but was in no way damaged.

The German steamers *KHALIF* and *ZIETEN*, now at Mozambique, have been renamed *FERNAO VELOSO* and *TUNGE*.

American Ship Yard Activities

A Snappy Summary of the Leading Events of the Month in the Vessel Construction Field

Canadian Ship Building Plant Sold

AS a result of long negotiations, the American Ship Building Co. on Nov. 2 sold its Canadian plant at Port Arthur, which was operated by the Western Dry Dock & Ship Building Co., to James Whalen, of Port Arthur. Mr. Whalen took the plant over at once and the price paid for the property was about \$2,000,000. The name of the company will not be changed, at least for the present.

The yard at Port Arthur was started eight or nine years ago by the American Ship Building Co., and a number of big ships were turned out at the plant. The company was offered a good price for the property and owing to the rush of work and the difficulty in operating a plant on the Canadian side of the lakes the officials of the company at a meeting late in October decided to sell and accepted the price offered by Mr. Whalen. The bonds of the company will be taken over by the new owners. Mr. Whalen has been at the head of the Western Dry Dock & Ship Building Co. for a number of years and is one of the best known vessel men in Canada. Among the vessels turned out at the Port Arthur yard were the steamer W. GRANT MORDEN, which is the largest Canadian ship and the longest boat on the lakes, and the big passenger steamer NORONIC. The company has closed contracts for three steamers of full Welland canal size. These boats, which were ordered by James Playfair, of Midland, Ont., are for the salt

water trade. One of the steamers will be completed in time to go to the coast this fall and the other two are for 1917 delivery.

The company has 100 acres of land at Port Arthur. The plant, which is up-to-date, includes a foundry, boiler and machine shops, and a drydock, which can take the largest boats on the lakes. The drydock is 700 feet long, 98 feet wide and 16 feet deep. The plant is located 1 mile from the entrance to Port Arthur harbor, and 4½ miles from the mouth of the river at Ft. William.

With a big ship yard and drydocks at Superior, the American Ship Building Co. will be in shape to take care of the boats in the Lake Superior trade. The company also has building plants and drydocks at South Chicago, Milwaukee, Detroit, Lorain, Cleveland and Buffalo.

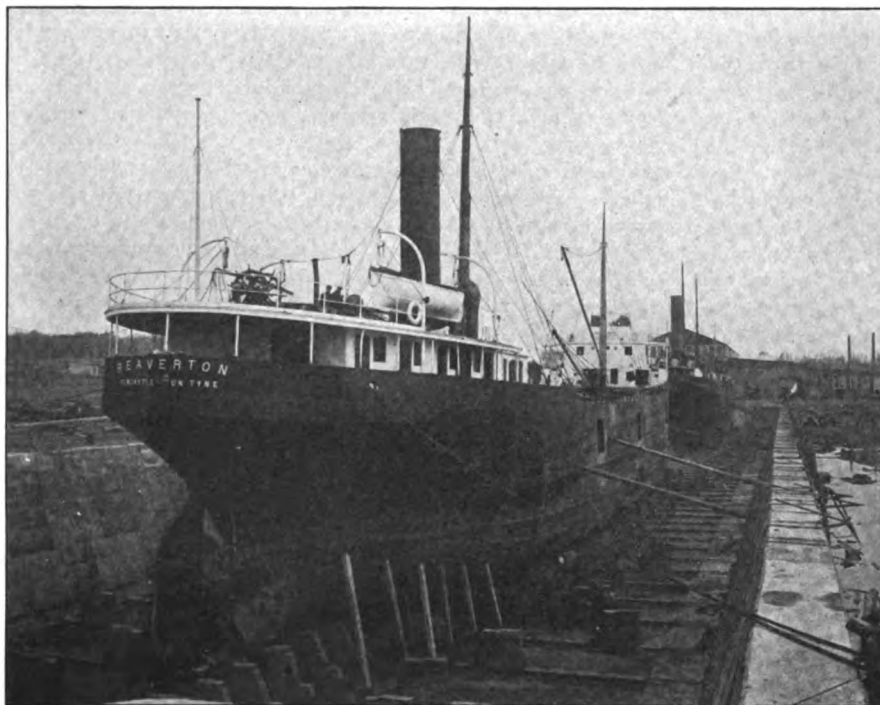
The steamer SIR TREVOR DAWSON, building at the yard of the Superior Ship Building Co., Superior, Wis., for

the Canada Steamship Lines, Ltd., Montreal, Que., was launched on Oct. 18. DAWSON is a 600-footer and was named in honor of Sir Trevor Dawson, R. N., president of the Canada Steamship Lines. The after end of DAWSON is the rebuilt section of the steamer W. C. MORELAND, which was salvaged after the steamer was wrecked. The new bow was launched Sept. 9. A complete description of the reconstruction work appeared in *The Marine Review*, August, 1916.

Tank Yard is Busy

The Tank Ship Building Corporation has considerably improved its plant at Newburgh, N. Y., by the addition of equipment designed to standardize the various stages of vessel construction. Included in the machinery which it now is installing are a large multiple punch and a spacing table for handling large ship plates. The company so far has engaged in the construction of vessels almost exclusively for the Southern Oil & Transportation Corporation, of which it is a subsidiary, and it is likely that the requirements of the parent company will keep it busy a long while to come. The first work done was the conversion of the yacht AMERICAN into a sea-going oil barge having capacity of 2,050 tons. It also just has completed three 1,050-ton steel sea-going tank barges.

Four more boats of the same type and capacity now are under construction. After



VESSELS UNDERGOING REPAIRS IN DRY DOCK AT PORT ARTHUR PLANT

the completion of these vessels, it is likely that some 10,000-ton tankers will be built. The yard, as at present laid out, has capacity for the simultaneous construction of six barges and two 10,000-ton vessels. The plant formerly was known as the E. J. Marble yard and up until its purchase by the present owners, was devoted largely to the construction of vessels for the Hudson river trade. It was acquired in June, 1915, by the Fuel Oil Distribution Corporation, another subsidiary of the Southern Oil & Transportation Co., and later the Tank Ship Building Corporation was organized. In addition to the construction of oil barges and tankers, the yard has engaged to some extent in general repair work.

Improvements at Bath

The Bath Iron Works, Bath, Me., recently installed a new 5-ton overhead crane which is devoted to handling plates as they are received at the plant. The crane runway commands

the new pickling bath. The company now is building torpedo-boat destroyers Nos. 66 and 74, a car float and a seagoing steam yacht for John N. Willys, Willys-Overland Co. These vessels are of steel with the exception of the car float.

The G. G. Deering Co., Bath, Me., is building a 4-masted wooden schooner. Percy & Small, Bath, also are building a 4-masted wooden schooner which will be fully equipped as an auxiliary.

The Texas Steamship Co., Bath, now has two 9,000-ton tankers under construction. The company is preparing to put in three more ways and on the completion of these, it will have capacity for building five vessels simultaneously.

The Kelly, Spear Co., Bath, just has completed and launched a wooden coal barge and it is building three more. These vessels are 3-masters, having a 235-foot keel, 41-foot beam, 245-foot length and are 19 feet, 6 inches deep. They have a cargo tonnage of 2,900 tons.

Follows Lake Practice

The Pennsylvania Ship Building Co. rapidly is bringing its new plant at Gloucester, N. J., to completion. This yard has ways for building six craft simultaneously. Incidentally, it is the only yard on the Atlantic seaboard where the side launching method, which has become so general on the Great Lakes, has been adopted. The company has contracts for 10 vessels. These include six 7,000-ton tankers, to be fitted with steam turbines, and four 12,500-ton cargo boats, to be provided with geared turbines, electrically operated deck machinery, etc. All these vessels will have a sea speed of 11 knots an hour. The work of construction is well under way and the first tanker is to be delivered in July, 1917. The main office of the company is in the Land Title building, Philadelphia, and the officers are as follows: President, H. E. Norbom; vice president, Charles H. Moyer; general manager, Henry Lysholm; secretary and treasurer, George S. Hoell.

Tunnel Steamer for Tropical River

By T. Osborne

SHALLOW-DRAFT steamers now form a distinctive type, for which there is a large and increasing demand. Such vessels are indispensable for the navigation of many inland waters, rivers, estuaries, lakes and land-locked sea areas in all parts of the world. A vessel representing the best results of many years' accumulated experience has recently been constructed in England. She is designed for both passenger and cargo service. The length of the run for which this steamer is intended is about 400 miles, on a dangerous and difficult river course beset with rapids and whirlpools, the positions of which frequently change as the river rises and falls with the seasons. The new steamer is intended to supplant smaller ones, which were warped up the rapids by means of ropes, necessarily a wearisome and often a dangerous operation. She will be sufficiently large and powerful to negotiate the rapids under her own steam, without warping. The vessel is 190 feet long, with a beam of 30 feet, the draft being 5 feet. Her steering gear consists of three balanced rudders actuated by both hand and steam. Two steam steering wheels are provided, one in the wheel house and one on the upper bridge. The hand gear is also in the wheel-house. The steering engine is in the

main engine room. The steamer, it is said, can turn within two lengths with both engines working at half power.

The hull is subdivided into 19 compartments by transverse and longitudinal bulkheads with water-tight doors, which are also fitted to the bunker bulkheads, as experience has shown that damage to the hull is more frequent at the turn of the bilge than on the bottom. There are four decks in all, the main, upper, boat and awning deck. Below, in a central position are the engine room and boilers, with two holds aft and three forward. On the boat decks aft are four boats, the salon and the cabins for European passengers and officers, with pantry, galley, bath rooms and the steward's cabin. A first and a second class salon, each with a group of cabins for natives; a third central group of cabins surrounding the engine room skylights; the wheel house, lavatory, filter tanks and three rooms for the purser, are situated on the upper deck. The main deck provides accommodation for 170 native steerage passengers, 15 firemen and three engineers. In the forecabin are accommodations for four petty officers and 12 men, also a mess room for 14 cooks and boys. The bottom of the steamer is flat and the sides are vertical, giving a box-shaped section.

The bottom slopes upward towards the stern, so as to clear the lower halves of the two screws and the rudders; the upper halves of the screws being in semicircular tunnels, rising from the ship's bottom, which is also sloped upwards under the forecabin.

Electric lighting is provided throughout, current being supplied by an oil-driven dynamo which makes it unnecessary to keep up steam when the steamer is moored for the night. The holds between the main deck and the vessel's bottom provide an aggregate capacity of about 16,000 cubic feet, and on a draft of 5 feet the steamer has a dead-weight capacity of about 300 tons. A double-headed auxiliary steam capacity is provided forward, one head being arranged for working the anchors and for ordinary warping purposes and the other for warping up the rapids in case of emergency. Rollers are fitted on the berthing for bringing in the warp. A large number of ballards and fairleads are placed forward and aft.

The vessel is equipped with two sets of triple expansion condensing engines of 2,000 indicated horsepower. Piston valves are fitted to the high pressure, mean and low pressure cylinders. All the bearings have large surfaces, so as to ensure satisfactory results with the engines when running at a somewhat higher speed than is usual with this class

of vessel. One condenser serves both engines and an independent air pump is provided in conjunction with it. A fire and bilge pump which is fitted in the engine room, is capable of pumping from several compartments on the sea or river. A feed filter tank is placed at the forward end of the engine room. The vessel's two double-ended watertube boilers are in closed stoke holds; each boiler is fitted with an independent funnel. These boilers are designed to provide overload power, when needed, by burning oil in conjunction with coal. As the steamer has to navigate waters which carry in suspension a considerable percentage of foreign matter, settling and filter tanks are provided instead of an evaporating plant. Three of these tanks are fitted on the deck above the engine room. The water supply is taken from a branch pipe off the fire and bilge pump discharge to the sanitary tanks. The water is discharged into the uppermost of the three tanks through a ball-valve, and flows from this tank into the second

one, which contains layers of filtering material. Passing through this, it flows into the third tank, in which it is again filtered. If necessary, the course of the water can be short-circuited.

As the efficiency of the propellers depends on their working in solid water, it is important that when the propellers commence revolving in the two tunnels, any entrained air must be forced out. The after part of the tunnel must project below the surface of the water, even when the steamer is at its lightest draft.

When the vessel is fully loaded and this projection is more deeply immersed, resistance is increased considerably. To meet this problem the after parts of the tunnel are movable and hinged, so that they can be adjusted to correspond to the vessel's draft. The forward part of the tunnel forms part of the hull, but the after part is hinged at a point about the center of the tunnel and adjusts itself to the varying conditions of load and draft.

New Ship Yard

The Oregon Ship Building Co. has been organized in Portland, Ore., by William M. Umbdenstock and associates of the firm of Umbdenstock & Larson. John H. Price, formerly with the St. Helens Ship Building Co., has been appointed general superintendent of the new company. The corporation has a capital stock of \$200,000. The company intends to build wooden vessels. It is expected that work will begin shortly on the equipment of a yard. Reports from the Pacific coast indicate that the demand for wooden vessels continues unabated, and it is believed that a number of new contracts will be closed during the present month. The wooden ship-building yards now operating on the Pacific coast are getting ready for the winter. At some of the yards, such as the Peninsula Ship Building Co., Portland, sheds are being erected for the protection of vessels under construction.

Ship Dictator Wanted in England

B RITISH ship building, while showing improvement in the output of merchant vessels, is still far from satisfactory, particularly in view of increasing war losses. This fact leads the *Liverpool Journal of Commerce*, to urge the appointment of a single government representative to control ship building.

Attention is called to the estimate of total war losses, amounting to 1,700,000 gross tons due to hindrance of new construction, 1,520,000 tons to actual war destruction, and 1,000,000 tons to excessive depreciation, making a total of 4,220,000 tons, to replace which the "ton for ton" policy is claimed to be essential. The article continues:

"After the war neutral ship owners will be in a very powerful position on account of the huge profits which they are making out of the war, for this capital will undoubtedly find profitable employment in the carrying trade for years to come. The competition will be exceedingly keen, and ship owners should not be unduly handicapped now, or left in the lurch when the contest between the nations of the world once more assumes a more peaceful character.

"According to Lloyds Register Ship Building Returns, the vessels completed during the quarter ending Sept. 30, 1916, amount to only 71,000 gross tons. The total for the present year to the same date is 200,000 gross tons, which compares with a normal output of 1,000,000 tons for the same period. These figures apply right up to a few weeks ago and, therefore, there is little justification for

optimism. On the other hand our future competitors are developing their powers of tonnage production at a very rapid rate, and they will be able to compete with this country for the supply of the world's requirements on a much better basis than in pre-war times.

"Seventy thousand tons per quarter, or one decent ship a week, is a ridiculous output. In spite of admitted difficulties it is hard for the outsider to believe that this cannot be improved, while everyone claiming any general knowledge of the situation is well aware that many more ships could be turned out without at all interfering with the more urgent requirements of any other section of our fighting machinery.

"Claims on the manhood of the country and on the output of material for more urgent purposes are admitted; there is no complaint on this account. What is not admitted is that it is necessary to employ a constantly increasing multitude of officials to stifle the best efforts of ship builders and apparently to ensure that what available labor and material there is will be wasted. The ship yards of the country, and the supplies of labor and material they so urgently require, are being wasted, at a most critical period of our history, by the grip of officialdom.

"The complaints against the existing system, or rather multiplicity of systems, each possessing its own little tin head, are universal. The ship builders have been governed by a sense of loyalty and a desire to do all that is possible, but there is a limit to what can be borne in

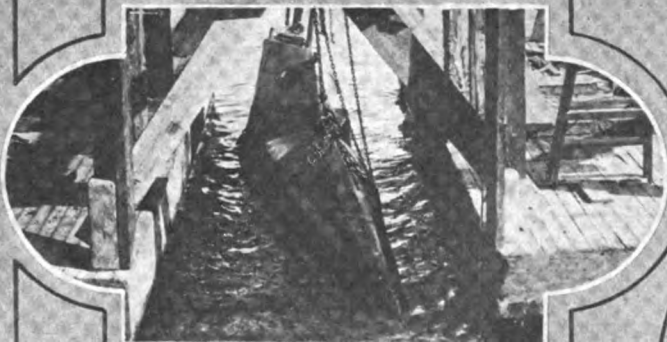
silence. The ship building industry needs one thing to put it right, namely, an autocrat, one strong man to govern everything; to see that the available supplies are not frittered away; to insure that the man who can best build big ships is given big ships to build, and not toy ships; in general to arrange things on a sensible basis and prevent every official suddenly possessed of temporary power from overemphasizing his own requirements and upsetting everything else.

"The shipbuilding work in this country will only be carried on efficiently under a dictator. The selfish interest of every department must be controlled, and the desire to keep a grip on firms which may conveniently be released for merchant work must be abandoned. One strong man is far more valuable and efficient than a thousand weak ones, whose very numbers are a handicap.

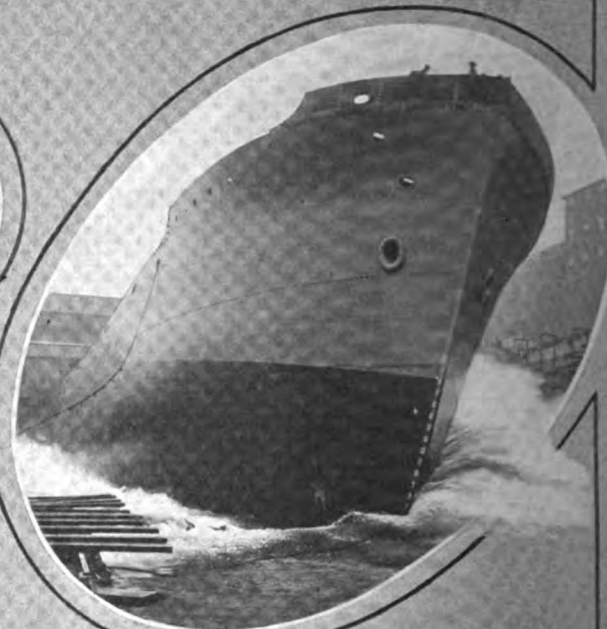
"The post of dictator is not difficult to fill. What is required is an individual who is intimate with the ship building industry, and whose career is a guarantee of strength of character, soundness of judgment and outstanding ability."

The firm of S. A. Lindykist, Stockholm, has bought lately from Danish owners a 6,000-ton deadweight steamer, and from Argentine owners two steamers, each of 2,000 tons deadweight. Besides this it has also contracted with a Canadian ship building yard for the building of two steamers. The total amount involved in these deals is about 10,000,000 kroner.

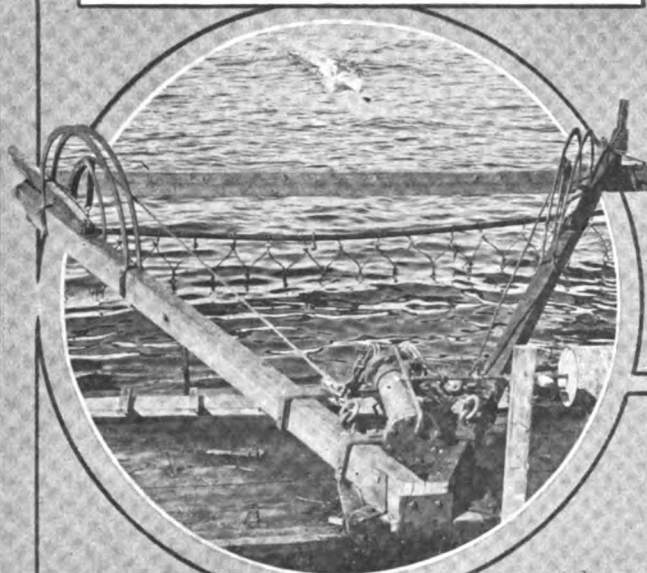
Camera Catches Marine News



A one-man submarine which comes to the surface when crippled. Her tests at Los Angeles were watched by U. S. navy officials.



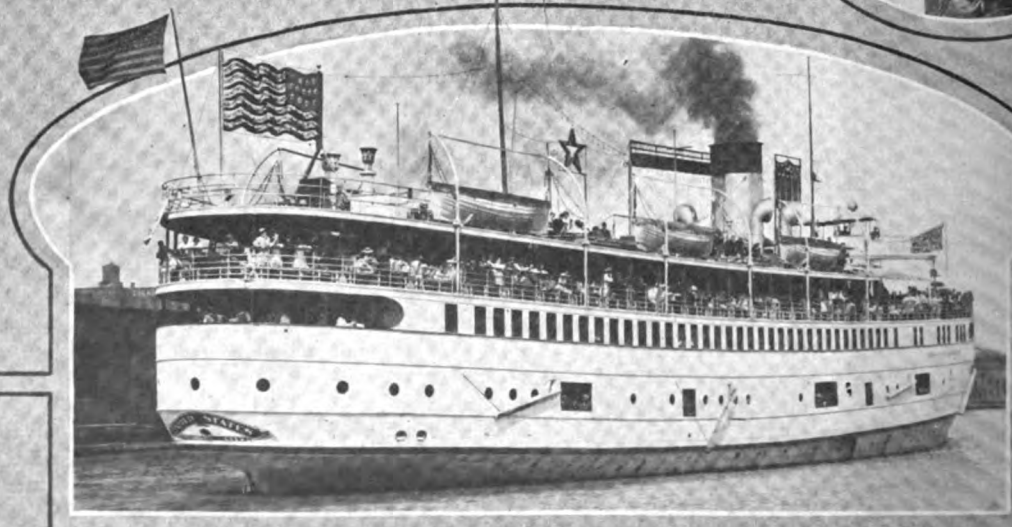
Born on the Maumee river, SUNLITE will sail soon to the far-distant River Plate. See page 408.



Making the torpedo a harmless toy. Head of torpedo is held in wire netting, while propeller spins futilely. (See background.)

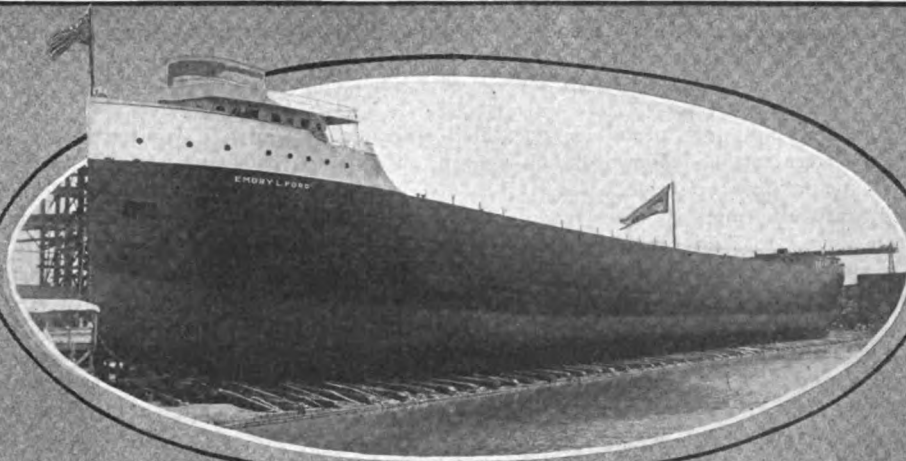


A fair sponsor for STANDARD ARROW, an 8,000-ton addition to the big Standard Oil Co.'s fleet. View taken at Camden, N. J.



Col. E. H. G. Green, son of the late Mrs. Hetty Green, world's richest woman, buys lake liner for a private yacht, at cost of one quarter million dollars.

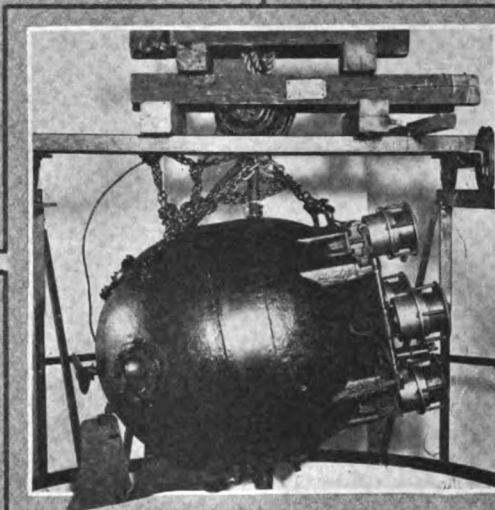
Maritime Events in Pictures



The big family of bulk freighters, native to the Great Lakes, is growing at a Rooseveltian pace. A view at Lorain, O.



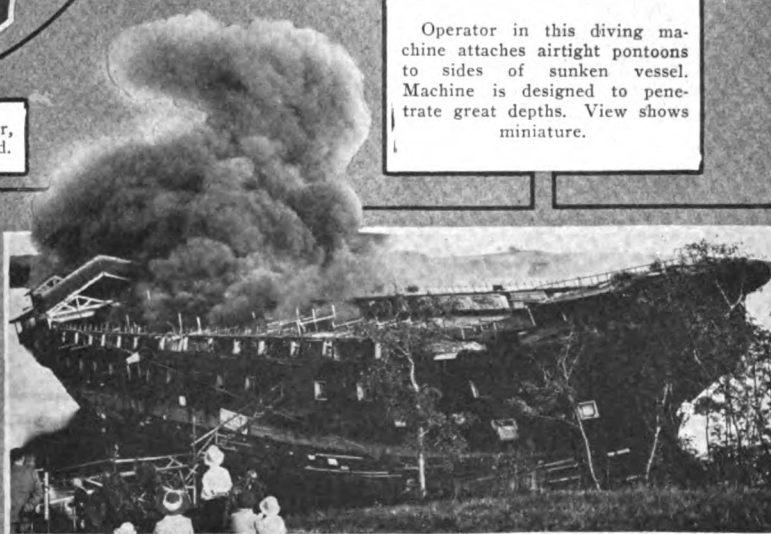
ARIZONA, our newest sea fighter, looks safe in hands of Capt. McDonald.



Operator in this diving machine attaches airtight pontoons to sides of sunken vessel. Machine is designed to penetrate great depths. View shows miniature.



An inspiring but still too rare a scene in American yards.



The gray smoke hangs like a shroud over the old FRANKLIN as she gives up her life for the government—for her scrap material.

How the Dreadnought Was Evolved

The Sturdy Sea Fighters, Now so All Important Abroad,
are the Result of Years of Patient Study and Experiment

By W. A. Dobson

THE ship of the line built of wood, reached its greatest development just prior to the civil war of the United States of America. The change from wood to iron covered a period of twenty (20) years, or from 1856 to 1876. A little later than the end of this period sail power was abandoned and steam relied upon entirely, the last full rigged ship of the United States navy being the NEWARK as originally built. In wooden vessels the United States led the way among the nations and its models and methods of construction were eagerly sought after and copied by foreign navies.

Slow to Adopt Iron

The Hartford and Franklin classes were of the best American type, and were immediately followed in the English navy by similar vessels. The United States was rich in building materials, especially in live oak, from which the frames of the vessels were made, and which was practically indestructible. For this reason, perhaps, as well as that its corps of naval constructors were men of great practical skill in wooden ship building, the United States continued the use of wood when the lack of such material was driving the European navies into the use of iron in place of wood.

A study of the construction of one of these fine specimens of naval construction is of great interest, especially when the construction was more or less composite. In the best vessels iron was used in strapping the frames both inside and out, and reinforcing the upper strength members with iron clamps. The vessels were full rigged, having auxiliary machinery capable of steaming at 10-knots' speed. They were fitted with two-bladed propelled wheels, which were hoisted or triced up above the water line when the vessels were under sails.

The vessels were armed with smooth bore muzzle loading guns, generally of 8-inch diameter of bore, throwing solid shot of 68 pounds and having a penetration of about 4 inches in wrought iron at close range. Later in the United States navy 11-inch pivot guns were used, one being

mounted on the centerline, usually forward, and served on either broadside.

The reason for the superiority of the United States designs for wooden vessels of this period is perhaps little understood at the present day. To fully appreciate it one must have intimate knowledge of the character and personality of the corps of constructors of the navy at this time. For many years the design of vessels rested in a board of navy commission, to which were attached a chief naval constructor and a chief engineer. Later both branches were detached from the active control of the line and became separate bureaus. At the head of the construction bureau stood John Lenthall, a man educated in the French technical schools of the time, which were certainly ahead of the world in mathematical investigation of the principles of applied mechanics, especially in the field of naval architecture. Mr. Lenthall was the peer of any naval architect of his time in technical ability and training, either at home or abroad, and to him alone must be given the credit for the strength of construction and harmoniousness of design that characterized the vessels of the United States navy at this period. The remaining members of the corps under him were men of great practical skill in shipbuilding and of great natural ability, though perhaps with little knowledge of the application of mathematical principles to the art of shipbuilding.

U. S. Had Best Ships

With Mr. Lenthall to advise as to the disposition and combination of materials, for the use of iron was adopted for increasing the strength of the members under greatest stress, and a score of men like William Hanscom, Mintoyne and the Harts to carry into execution his ideas, the United States had the finest wooden vessels afloat, by right of technical and practical skill, which we are little apt, in these days of more widely diffused knowledge, to be willing to accord to these giants of their day.

Unfortunately Mr. Lenthall did not believe in the Monitor type and refused to commit the bureau to the advocacy of their construction. The

"Monitor ring" was strong both in politics and in the Gustavus Fox wing of the navy administration, consequently the design and construction of the Monitors prior to 1875 were taken out of the hands of the bureau of construction and repair and placed in the hands of the engineers of the navy, with Mr. Stimers at their head. The result of the study and design of the engineer board was the class of Monitors known as the light draft Monitors which owing to a miscalculation would not float and proved a complete failure. As a "cub" in the Roach shipyard, I was much interested in seeing several of these broken up and noting the skill displayed in their construction. After this fiasco the design of the Monitors Puritan and Miantonomoh class were placed in the bureau of construction and repair under Isaiah Hanscom, who succeeded Mr. Lenthall as chief of bureau.

Scarcity of Building Material

The scarcity of building material led to the building of iron vessels in the English and French navies. The idea of an armored vessel seems to have occurred to both these nations at about the outbreak of the civil war with us and the result was the WARRIOR in England and the LA GLOIRE in the French navy. The belt of armor on each vessel was made 4 inches in thickness, which was sufficient to repel the 8-inch smooth bores of the day at fighting range. It should be borne in mind that vessels carried as many as 50 of the 8-inch 68-pounders arranged in broadside with bow and stern chasers. While this development was going on abroad some of the brightest minds, quickened by the possibility of war in the United States, were giving earnest thought and study to a fighting machine, notably John Stevens and Theodore Timby, American-born citizens, and John Ericsson, a Swede, who afterwards became an American citizen. Stevens made the plans of a remarkable vessel called the STEVENS BATTERY, and at his death left a sufficient sum of money available for the completion of the vessel. The vessel, however, was never completed, but some of the features of her design will be referred to later on. Theodore Timby had given years to

Read before the Engineers' Club of Philadelphia.

the perfection of a revolving fort or turret of steel, in which was housed a number of guns. This fort he mounted on a raft which was intended for harbor defense. I have talked with Mr. Timby, and have gone over with him the original plans made in the '50's, and am glad to bear testimony to the originality of his design. It remained, however, for the genius of Mr. Ericsson to combine the ideas of both Timby and Stevens in the epoch-making vessel known as the MONITOR. I fully believe Mr. Ericsson was working along entirely independent lines from either of these gentlemen, but all three had many ideas in common, and the fact remains that Mr. Timby was so protected by patents of his design that Mr. Ericsson had to pay \$5,000 royalty on each of the turrets fitted on the Monitor class.

Influence of Stevens Battery

Just here we will refer to the Stevens battery, which has a lasting influence upon subsequent warship design. Its building period extended over such a term of years, from 1860 to 1870, that many of its original features were modified entirely and the experience of the naval combats of the civil war incorporated. However, Mr. Stevens started out to build an armored vessel with guns of one calibre carried in revolving turrets. In this general conception he and Ericsson were on common ground, but Stevens went much further. He introduced the armored deck with sloping sides extending down to the lower edge of the armor belt, precisely what was known as the protective deck of later years. His main belt extended from stem to stern. The vessel was fitted with twin screws and the same type of balanced rudder now fitted to nearly all United States battleships found its prototype in this wonderful vessel.

Unfortunately the vessel passed into the ownership of the state of New Jersey and was never fully completed. Attention, however, is called to the features incorporated and actually built which afterward became fundamental in battleship design:

1. Battery of one-calibre guns mounted in turrets.
2. Twin screws.
3. Protective deck.
4. Balanced rudders fitted in the deadwood or run of the vessel.

While these features were being dreamed upon and slowly put into execution, Mr. Ericsson, for the Northern States, and the designer of the reconstructed MERRIMAC were pushing ahead and forcing upon their governments types of vessels that were to revolutionize the design of war ves-

sels the world over, and which were known as the MONITOR and MERRIMAC. In the former was the complete water-line belt and armored deck with guns mounted in turrets, while in the MERRIMAC was found the armored casemate with sloping sides and the ram. The combination of these features has been perpetuated in battleship design to the present day.

The United States government was so exhausted financially by the long war that it had neither means nor inclination to carry into effect the many lessons of the war, but England, ever watchful, profited to the utmost by the experience gained in our naval engagements and embodied them in the navy of iron vessels she was rapidly building.

About this time there arose in England a group of notable men who by practical and technical training were well able to establish and apply the valuable lessons of the American civil

New Battle Cruisers

Each of the four battle cruisers for which bids will be opened at the navy department at noon on Wednesday, Dec. 6, will be 850 feet long, or 100 feet longer than the Woolworth building is high. The displacement of the vessels will be about 35,000 tons, their speed will be between 32 and 35 knots, and they are intended to be the most powerful of all armored cruisers. Each vessel will carry ten 14-inch guns.

war. These were Scott Russell, Brunel, Sir Edwin Reed and Rankine, followed by William John, William White, Nathaniel Barnaby, Francis Elgar and Martel, while in France such men as DeBusby and Bertin were investigating and working along the same line.

New Designs Evolved

To Russell must be accorded the credit of starting scientific inquiry into the lines of the least resistance, to Brunel the best disposition of material to meet longitudinal stresses, and to Reed and his young assistants the cellular construction and framing which did so much to obtain the necessary strength with less weight.

The designs evolved ran the gamut of the armored broadside with multiple guns of the Warrior type to the battery of few guns of larger calibre mounted in turrets, such as the Devastation type of high freeboard Monitors. These designs finally worked into the mixed gun battery with the large guns mounted in turrets or bar-

bettes and the smaller guns in armored casemates. This type of battery prevailed in one form or the other, up to the time of the Russo-Japanese war. The fight through that long period was between armor and guns, with varying results. At one time the armor would defeat the guns, then the guns would penetrate the best armor made. The same fight is still on, with honors resting with the guns. Then began the long-fought question between speed and protection and armament, or the feature of offense and defense.

Russo-Japanese War Lessons

The lesson hastily drawn from the fight in the Japan sea was the all-gun battery of heavy guns, with a numerous secondary battery of very small guns. Calm and cooler consideration, however, has given the larger calibre rapid firing gun its old place as a defense against torpedo craft, with the exception perhaps that protection for this class of gun has been dropped. The cycle has been made and we are again with batteries of mixed calibres just as at the close of the civil war, only with all the tremendous increase in power and rapidity of fire.

At the time of the Spanish-American war our battleships had as their primary batteries 13-inch or 12-inch guns, combined with 8-inch, all in turrets, the heavier guns being mounted on the centreline forward and aft, and the 8-inch on either beam. The secondary battery ranged from 6-inch down to 3-pounder rapid fire guns. The chief lessons taught by this war, insofar as battleships are concerned, were the value of keeping a navy in the pink of condition, both men and material; the necessity of radical changes in our own target practice; and the necessity of adopting smokeless powder. The gallant effort of Cervera's fleet, without proper stores or good ammunition, and its pathetic destruction, as compared with the famous trip of the OREGON, speaks volumes for the necessity of a high standard of naval efficiency and drill. The remarkably low number of hits for the number of shots fired was a surprise to our naval authorities and brought about such a radical reform in target practice, mounting of guns and service of ammunition, that today our vessels are excelled by none in the number of target hits.

For the purpose of our discussion, the features of the modern Dreadnaught may be considered under two heads: viz., Offense and Defense.

There is a certain amount of displacement at the disposal of the

designer, for the sum of all the weights must equal the displacement at a given line of flotation. Therefore, no one feature can be abnormally emphasized except at the expense of some other; for instance, to carry a great number of heavy guns and ammunition means thinning down the protection in shape of armor. The vessel may be strong in offense but correspondingly weak in defense. The speed may be made extremely high, and combined with heavy armament will produce a vessel that can deliver a blow and run, but she cannot take punishment, for she must lack commensurate protection. It seems, therefore, that the wiser policy is one of good speed and equally balanced armament and protection. These are the general features followed for American dreadnaughts. The amount of weight devoted to the comfort and health of the ship's complement can well be considered as belonging equally to offense and defense, for the sound mind and the sound body are pre-eminently necessary for the successful issue of the battle.

The features of offense may be grouped under three heads: 1st, the battery of primary or heavy guns; 2d, the torpedo battery; and 3d, speed, when considered as a means of overtaking an enemy and choosing the weather gage at the time of engaging.

The features of defense may likewise be grouped under three heads: 1st, armored protection; 2d, the auxiliary battery, as a means of repelling torpedo boat attack; and 3d, speed, as a means of refusing an engagement only.

The two divisions are so closely interwoven as to make it hard to consider them apart except in general terms. We may, therefore, take up the features in a general way and afterwards combine them.

Main Feature of Offense

First comes the main feature of offense, i. e., the primary battery. Almost all nations have come to the one-gun battery for its chief weapon of offense. These guns range from 12 inches to 15 inches in diameter of bore, with the prospect of going as high as 16 inches. The weight of armor-piercing shell and the bursting charge vary in general terms as the cube of the diameter of the bore of the gun. It will be seen, therefore, that the impact from a 15-inch shell is practically double that from a 12-inch shell.

The emplacement of the heavy guns, therefore, is one of the first importance, for the gun must be so placed as to command the greatest

arc of fire at such a distance from the water as to be fought in moderately heavy weather, and so placed that its protection by heavy armor is feasible. This opens the question as to whether head and stern fire or broadside is the more valuable. Some designers sacrifice weight for the supposed advantage of head and stern fire. In coming up with and engaging an enemy no doubt head and stern fire will be valuable in the hope of getting in a crippling shot at very long range, but when the vessels are within good fighting distance it is most natural to suppose that the pursued will sheer enough to bring the greater number of guns, or her broadside, to bear on the pursuer, who will also adopt like tactics so that the fight will continue, the vessels circling in parallel lines.

The South Carolina Class

In fleet action the use of the battery in broadside is the one giving the greatest delivery of metal. It, therefore, seems that the greater advantage is to be gained from a moderate degree of head and stern fire combined with the heaviest possible broadside fire. To obtain this with the least weight of protection we are irresistibly led to placing the guns on the center line so that they may fire on either broadside. To have the advantage of this system and at the same time obtain good head and stern fire the United States designers were forced to place the second set of turret guns from the forward and after ends, so that they could fire over the guns in front of them. This emplacement was brought out in the South Carolina class and strongly criticised at first, especially by England, who feared the effect of the blast from the upper guns upon the crew of the lower turret. Exhaustive experiments in this line have proven that the fear is groundless with the result that this emplacement has become the standard of all nations.

In the early American dreadnaughts the heavy guns were mounted in pairs in turrets, using the standard American emplacement. This arrangement gave at the best four guns ahead and astern, with the broadside varying in accordance with the number of turrets mounted. This has given place to mounting three, and in the French navy even four, heavy guns in a single turret. With a battery of 10 or 12 heavy guns the emplacement may be made in four turrets, the forward guns and their ammunition being entirely clear of and forward of the machinery, while the after guns and ammunition abaft the machinery. This

is a most desirable arrangement, as it lends itself to the better ventilation of magazines and prevents interruption between engine and fire rooms. In one case we may have three guns each in the lower turrets and two each in the upper firing over the turrets below. This would give five heavy guns ahead and astern and ten on either side. By using three guns in each turret the head and stern fire may be increased to six guns and the broadside to 12. The French in their latest design have placed four guns in one turret. With 12 guns, if mounted in four turrets, this would mean no increase in head fire over the three-gun turret, but renders it possible to mount all 12 guns in three turrets, with the second turret firing over the first, giving eight guns ahead, 12 on broadside and four astern. All sorts of variants may be made by using the several types of turrets here spoken of. Personally, I do not believe the four-gun turret will prove successful. The outboard pair of guns must be placed so far from the center that in firing a single pair the whip must be enormous. Of course, in firing in salvo this objection is not a serious one. However, the number of guns per turret may vary. The mounting of all heavy guns in turrets protected by armor and placing these upon the center line has been universally adopted and the United States must be given the credit for originating this plan, embodying the greatest efficiency with the least weight.

Torpedo Battery

The next feature of offense is the torpedo battery. The use of torpedoes on battleships is almost universally confined to submerged tubes. As these are placed generally in broadside below the waterline, they are from their location well protected. There seems to be little actual experience from which we may measure the value of this arm of offense. The range has been greatly increased, and from the fact of their power to damage a vessel so much greater than the gun they must have serious consideration. They are used at comparatively close range and, therefore, must necessarily be the weapon to aid in giving the finishing touch to the conflict. A vessel may be fought after she has been hit by many projectiles from the main battery, but she cannot survive many hits from modern torpedoes.

These weapons deliver their blows below the armor belt and at the most vulnerable part of the ship, so that one explosion from a successful de-

livery may seriously cripple the battleship, and more than one may put the ship out of action. The old MAINE in Havana harbor is an example of the destructive effect of an underwater explosion.

Speed is next to be considered as a means of offense. It can well be conceived that under certain circumstances speed is a most valuable adjunct to the offensive power of a battleship. It means arriving speedily at the scene of action, the overtaking of an enemy, and the choice of the weather gage, all valuable assets for the battleship, but where we emphasize speed in excess of 21 knots at the expense of armament and protection of the vessel we are departing from the true battleship. It is possible to conceive a cruising battleship with such heavy guns lightly protected, and such tremendous speed that she can keep out of range of the slower vessel with more protection and less calibre of guns, and deliver her blows with impunity. This may look well on paper, but it is entirely possible to arm the slower vessel with the largest calibre guns. Then the usefulness of the swifter but lightly protected vessel as a first class battleship ceases. I fully believe the United States is right in adopting a speed of about 21 knots and putting the difference of weight into protection. It seems to me to be a fallacy that the most efficient protection that can be given to a ship is the protection furnished by its own powers of offense. This has been ably argued by some of the leading experts, especially in England, but the answer seems to be found in a fewer number of equal calibre guns, but so well protected as to be able to reply with full vigor to the first onslaught of the vessel with a greater number of guns with little or no protection. It was the expectation of artillery experts that with the present accuracy of gun fire and firing "in salvo", an engagement between battleships will be settled in less than 10 minutes. The staying power, then, is to be found in armored protection to the primary battery and vital parts of the vessel. If this theory is well founded, the engagement will be over before a ship's torpedoes can be brought into action, and the value of torpedo craft during an action of such short duration very much lessened.

Features of Defense

This brings us to the features of defense. It is obvious that to have a perfect fighting machine we must be able to protect our motive power, our ammunition and supply of same, our guns and the stability of the

vessel. In other words, the armored portions must be sufficient in area and thickness to have our vessel a floating fort capable of fighting its guns and of being maneuvered at will, even after the habitable portion has been swept or laid open to the sea by gun fire. This means a careful consideration of the moment of inertia of the plane of flotation included within the armored area, and which may be considered as remaining intact after the most severe fighting.

Taking, then, a four-turret battleship carrying ten to twelve 15-inch guns as its primary battery, and hav-

Big 35-Knot Scouts

The new scout cruisers will be the first scouts, designed for that work alone, to be added to the navy. The old light cruisers SALEM, CHESTER and BIRMINGHAM, known as scout cruisers, have not the speed necessary for a modern sea picket.

The scouts will make a sustained speed of 35 knots an hour. They will look like big destroyers and be nearly six times as large as the greatest torpedo craft, displacing 7,100 tons and having a length of 550 feet. The mass of machinery necessary to drive them at express train speed will be covered by light armor. Each cruiser will carry eight long range 6-inch rifles, two 3-inch anti-aircraft guns and four torpedo tubes. The most striking new features of the ships will be the installation of catapult devices which will permit the launching of hydroaeroplanes in any weather. Each scout will be fitted to carry four aircraft to extend her range of observation.

ing sufficient power to give a speed of 21 knots, it would seem that the main armor belt should extend to and include the foremost and aftermost barbettes protecting our turret gear and ammunition supply, and should be at least 15 feet in depth. Forward and abaft these points the armor should extend to the bow and stern in the form of a waterline belt. At the top of the main belt should be worked the main protective deck carried flat across the vessel; below, at a height of about three feet above the load line, should be worked a splinter deck turning down at the sides to meet the armor shelf. The slopes of this deck should be of considerable thickness to take care of shell fragments.

It may be of interest to dwell for a few moments on the development and application of the turtle back or protective deck to war vessels. As mentioned earlier in the paper, the Stevens battery incorporated this feat-

ure, but before this a lieutenant in the United States navy, by the name of Hunter, invented an armored deck with the sides sloping down at the sides of the vessel below the waterline.

Development of Foreign War Ships

In the development of foreign war vessels this system was adopted for the protection of the magazines and machinery of protected cruisers and in some cases sole reliance for protection to the vital portion of the vessel was placed in decks of this sort for ships of large displacement and heavy artillery. Later on, this principle was applied to battleships, the idea being that if the projectile penetrated the belt armor the armored deck would stop the fragments of shell or deflect the solid shot.

The accepted method of the present day is to work a flat deck of armor at the top of the main deck and a sloping deck not more than one and one-half inches thick on the slopes as a splinter deck.

It has been proposed to work the main belt in two thicknesses having a space between filled with wood, the outer thickness to be two or three inches and the remainder of belt in one thickness; the object is for the outer belt to receive the first shock of capped shell and the second or main thickness to deflect the shell which would be decapped by the outer armor. The barbettes and conning towers would begin at the main armored deck and be carried as high as the design would require. We would then have an armored raft with forts formed by the turrets and barbettes, the armor absolutely protecting machinery, magazines, ammunition supply, steering gear, guns, commander's position and means of interior communication, and the stability of the vessel. The rest of the vessel could be shot away and yet the fighting machine be intact. We are, however, still in danger from torpedo attack. To guard against this, internal armor is fitted abreast magazines and machinery corresponding about to the limits forward aft of the deep belt of external armor, extending from the inner bottom to the splinter deck. The space between the armor and the outside plating (which should be as great as practicable) is divided in cellular compartments. From attack by torpedo boats our defense lies in the auxiliary battery of rapid fire guns of sufficient size to sink the small craft. These gun positions should be unarmored, that is, not protected by armor, for armor commensurate with the size of guns would be smashed

into fragments by the heavy guns of the enemy's primary battery and become a distinct source of danger from the mitraille. It therefore seems useless to expend good displacement in this manner. If the theory of the artillerists is a sound one, that the battle will be over in less than ten minutes, torpedo boat attack during an engagement is impracticable and should be made preceding a battle. If, however, as many hold, the battle is to occupy considerable time, it would appear that the psychological moment for torpedo boat attack would be after the battle had been under way for some time and the auxiliary battery put out of commission. Speed as a means of defense seems to be solely in the ability of the vessel to keep out of danger by refusing to engage, but this would be against all traditions and avoiding the very purpose of the battleship.

Location of Magazine

The location of magazines at their best is forward and abaft the machinery spaces. There the magazines can more readily be kept cool and the stowage of ammunition not interfere with the arrangement of the boiler and engines. The powder used, nitrocellulose, in our guns deteriorates very rapidly when heated above 90 degrees Fahr. It, therefore, becomes necessary to ensure the stability of the powder and to prevent the generation of dangerous gases caused by the decomposition of the powder by means of cooling the magazines artificially and so keeping the temperature down to a point of safety. To accomplish this the magazines are lined on the inside with compressed sheet cork varying from two to four inches in thickness. This is cemented directly to the steel plating, frames and beams of the steel structure. After the cork is in place the seams and joints are smoothed up with plastic cement and then the whole surface coated with plastic cement until a smooth surface is obtained. This surface is in turn painted with gloss paint, the object being to obtain a polished surface which will be slow in radiating heat. The rougher the surface the greater the radiation of heat, for each point acts as a radiating fin. The smooth gloss paint gives as near as may be a uniform surface with slow radiation. The magazine having been insulated in this manner, a series of supply and exhaust ducts are fitted, reaching to all parts of the magazine. The air drawn in the first place from the atmosphere is forced through an air cooler and moisture separator. By closing the intake from

the atmosphere the air is circulated to the magazines and back through the cooler until the desired temperature is reached. The admission of air to the magazines is controlled by thermostats and dampers, which enable us to keep a uniform temperature in the magazines.

The present day battleship resembles a miniature city in its provision for the safety and health and comfort of its officers and crew, to which must be added all the apparatus for sending this mass through the water at a speed of 21 knots, or nearly 25 miles, an hour, and handling the vast engines of destruction lying latent in its magazines and enormous guns.

Let us look at these. First, we must have light throughout the vessel, so an electric plant for lighting must be provided and wiring to conduct the current to all parts of the vessel. Drinking water must be provided, so an evaporating plant is fitted to enable the salt water to be turned into good potable water. This is conducted to the various bath rooms, laboratories and drinking scuttles throughout the vessel.

Heat must be provided and means arranged whereby fresh air, heated by steam, is forced into and through the living quarters.

The turrets and guns must be so mounted that each set may be trained at will, or elevated and depressed, as one man may elect. Reliable apparatus for this purpose must be provided. The ammunition must be brought from the magazines down below the waterline to the breeches of the great guns in the turrets some 50 feet above; each shell may weigh three-quarters of a ton and must be brought precisely to the loading position at the rear of the gun. Then a rammer must reach forth its long jack-knife like arm and push the shell and then the powder home in the chamber of the gun. This must be done in any position of the gun, so that electric mechanism reliable and flexible to a degree must be provided.

Stowing Small Boats

The vessel must have apparatus for mooring and docking, so winches driven by electricity supply this want.

Outside of a navy yard, when a war vessel is in commission, she is rarely tied up at a dock, so that small motor and row boats are a necessity for communication with the shore. These boats must be stowed out of the blast of the guns, for, although in a battle the boats are lowered and moored in the open sea, yet in peace time the boats must be so stowed that the guns can be fired at target practice

without tearing them to pieces by the blast. This necessitates nesting them and handling them by cranes or derricks operated by electric winches.

A gear for the rapid coaling of the battleship must also be installed, which finds its best motive power in electricity. The most modern, approved type of steering the vessel is by mechanism actuated by electricity, for this action is positive and reliable, and such an apparatus eliminates steam pipes with their heat and leaks in the living quarters and storerooms.

In addition, the ice machinery, laundry equipment, galley and baking apparatus are operated by electric motors, so that the battleship must be provided with no inconsiderable electric power plant.

The Ice Plant

As referred to earlier, the magazines must be artificially cooled, the perishable stores for the food supply of some 1,200 men must be kept in cold storage, and ice for ship's use must be made. To accomplish this an ice plant is provided. Up to the present time the type of ice machine used is the "dense air", in which the air is alternatively compressed and cooled, then expanded.

A sewerage system must also be arranged for, as we have on a Dreadnaught as many people as are found in many villages of the first class. Consequently, drains from baths, toilets, washrooms, galleys and decks all have to be provided.

The battleship is no exception to the general dictum that "bread is the staff of life". Therefore, means for supplying some 1,200 men with good bread are ample and thorough. Bakeries are fitted, provided with power operated dough mixers and with dough testing apparatus. In addition, all utensils for cake and pastry baking are provided.

Next comes the laundry, for the clothes of the sailors are washed and ironed by machinery; so all the appliances, both steam and electric, found in a first-class laundry have their counterpart on a battleship.

Then the sick must be cared for, ordinary cases of illness separated from contagious diseases and from those where the knife is the sole resort. We have, then, the ordinary hospital or sick bay with its contagious ward, and an operating room furnished with all the antiseptic appliances and instruments needed for successful operations of the most serious character.

Next comes attention to the moral and spiritual side of the natures of the men. It is human to err, and the

crew of a dreadnaught are intensely human; hence, a jail on shipboard with several cells, where a diet of bread and water tends to good resolutions. But all men are not bad and bad men are not always in trouble, so there is a chaplain on board who at stated periods conducts divine service and to this end must be provided with a pulpit, and this makes the church.

Battleship a Fortified City

So each battleship is a fortified city, carrying within its armored walls all the activities of the ordinary citizen, but always with the refining and civilizing influence of women absent, and we have nearly all the ordinary municipal plants in operation, for we have light, heat, water, drainage, power, hospitals, church and laundry plants quite as in a well ordered city.

In the evolution of the battleship, one element of doubt pertaining to its design has been removed, and can now be determined beforehand with absolute and scientific accuracy. I refer to the powering of the vessel.

In the days when fourteen knots was considered a high speed the power necessary to drive the vessel at a speed not exceeding fourteen knots was ascertained largely by the use of Rankine's formula, which took into account the wetted surface of the vessel, the entering angles of the vessel's form and the water set in motion by the passage of the vessel through the water, or what he termed augmented surface.

When higher speeds came more and more into vogue it was seen with regret that Rankine's formula had its limitations and something more reliable than an "educated guess" must be substituted. About this time Mr. Froude began his resistance investigations on behalf of the English Admiralty, which became world famous and led to the promulgation of the method of comparison known as Froude's Law of Comparisons. This was a great boon to the designer, where it was impossible to have the resistance of the model ascertained by tank experiments, provided that one had a sufficient stock of trial data for vessels somewhat similar in form. This was the method used by the Navy Department prior to the installation of the model basin apparatus at the Washington Navy Yard, under the auspices of the Bureau of Construction and Repair. In those days it was customary for the Bureau of Steam Engineering and the Bureau of Construction and Repair to prepare independent curves showing the power required at various speeds and then

compare them. A reasonable margin was added to the power for safety's sake, and then in designing the machinery a little margin was allowed to be sure that the prescribed power would be obtained. From this it can be seen that it was not so difficult a matter to obtain a very considerable premium for speed in excess of the contract requirements, when such bonuses were allowed. With the coming of more exact methods, instituted by that very able constructor of the United States Navy, Mr. David W. Taylor, the bonus system was swept away and the contract made for a definite speed; anything obtained above it was simply glory for the contractor.

Ascertaining the resistance of the model for a certain range of speeds not only causes one to await quietly, without undue loss of sleep, the outcome of the speed trials, but makes it easier to place the cause of the trouble, if any is experienced, where it properly belongs.

Where the Fault Lies

In the old days, when the vessel failed to realize her expected speed the engineer at once laid full blame upon the form of the hull, a trick not yet entirely forgotten by our brothers on the engineering side of the fence. Now that the hull resistance can be definitely foretold, and the engines found to be capable of developing the required power, inquiry turns at once to the design of the propeller wheel

as the unknown factor, and one where experiment may give beneficial results. In other words, it narrows investigation down to one element instead of any one of three. There is still further benefit to be derived from model tank results in warship design, where every ton of displacement is of great value. In general terms, increase in power means increase of weight, and when a generous allowance has been made to insure the necessary power being obtained it must be at the expense of weight; in other words, some other department of the vessel is being robbed of its proper share of the given displacement in order that we may be sure of our speed. The model tank prevents this by showing us the necessary effective horsepower at the very start of the design. This also follows into the radius of action for a vessel. The necessary fuel for a given radius may be accurately ascertained and unnecessary weight saved which can go into the armament or protection.

The design and development of dreadnaught battleships present as many features of interest today as war. The gun is undefeated by armor, and the submarine has had no adequate reply made to the possibilities of its attack. A feature that must be given serious consideration is protection against an attack from the sky. This may well take some form of turtle back in connection with the upper level of protective deck plating.

Arizona in Commission

THE superdreadnought ARIZONA, latest addition to the United States navy and the largest and most powerfully armed fighting ship ever built at the navy yard in Brooklyn, went into commission Oct. 17, while the blue jackets from half a dozen other dreadnoughts, the yard staff, and a large number of civilians looked on.

Rear Admiral Nathaniel R. Usher, commandant of the yard, during whose administration so much government work has been done there, read the orders from the navy department which made ARIZONA an active unit of the Atlantic fleet, after which Captain John D. McDonald read his own orders from the navy department to assume command of the superdreadnought. Then the band struck up the "Star-Spangled Banner," a big new silken flag was hauled aloft, and ARIZONA was in active service.

For weeks past the crew of ARIZONA had been assembling, most of the men coming from the battleships KANSAS,

VERMONT, and NEW HAMPSHIRE, three ships of the predreadnought type which were transferred recently to the Atlantic reserve fleet.

CONNECTICUT, the sole remaining vessel of the predreadnought type now in the Atlantic fleet, is destined to go into the reserve shortly. The Atlantic fleet has been reorganized, so far as its first fighting line is concerned, into an all-dreadnought fleet, and by this time next year, when the new IDAHO and MISSISSIPPI go into commission, the fleet will form one of the greatest naval fighting forces in the world, with 19 vessels of the dreadnought class comprising the four active battle divisions.

"Do you realize," said an officer of ARIZONA, at the ceremonies, "that ARIZONA has more big guns than KANSAS, VERMONT and NEW HAMPSHIRE combined, and that a broadside from ARIZONA's 12 14-inch guns weighs 6,600 pounds more than would a broadside from all the 12-inch guns on those three ships."

In the Traffic Manager's Office

A Review of the Month on Coasts and Lakes—Useful Pointers
for the Men Who Get the Business

Barge Canal a Great Connecting Link

AS THE New York barge canal nears completion the important part it seems destined to play as a connecting link between other great waterway systems becomes very apparent. A study of the relationship the barge canal bears to the wide area of surrounding territory forms an interesting subject for consideration.

During 100 years of canal-building, New York has led the union in this particular form of internal improvement. Single-handed and alone the state has undertaken and carried through its great task. That other states have been benefited by these waterways cannot be questioned and that the area of this beneficence has covered a large part of the whole country must likewise be conceded. Of necessity this must have been so, and in the future, as in the past, the same condition must remain, since the state cannot serve itself in fullest measure without including others in this service.

In making its latest improvement—the building of the barge canal—New York is also primarily doing something for its own benefit. But, as we have seen, this beneficial service must of necessity extend beyond its own borders. A few examples of the extent and nature of this beneficence, which becomes mutual between New York and its sister states, may be enlightening.

An Object Lesson at Panama

One result of the opening of the Panama canal has been to bring pointedly to the minds of shippers the difference in rates between rail and water-borne transportation. In the lumber trade this difference has been seen very clearly. The forests of the East have become so nearly exhausted that for some time the east has had to draw much of its supply from the Pacific coast states. As soon as the Panama canal was opened this traffic began to turn, western lumber coming by boat to Atlantic or Gulf ports and then being re-shipped by water or rail to the in-

terior of the whole eastern half of the country. And this has come about because the saving in cost has been a considerable sum on every thousand feet.

A study as to how the New York barge canal will extend the limits to which Pacific coast lumber may profitably be shipped by the water route brings out some interesting facts. If we consider that the lumber which has come by boat from the Pacific coast to New York city continues to move by water, reversing its general course and going back west through the barge canal and on through the Great Lakes as far as they extend, and then, if we compare the cost of transportation by this route with the cost to ship the same lumber overland by rail to the same points at the western extremities of the Lakes, we find a balance in favor of the water route, although the distance traveled is several times that by land. Now, if we use this balance to move this water-borne cargo still farther to the west, using railroads, of course, we shall reach a point where the cost of transporting this cargo will exactly equal the cost of the cargo coming overland by rail. Drawing a line through several points obtained in like manner, we shall obtain a boundary which we may call the "line of equal costs". The interesting fact about this line is that it is away to the west of the Mississippi river, scores, and in some cases, hundreds of miles. The area thus benefited by the barge canal includes most of the northeastern quarter of the United States, embracing the territory east of this line of equal costs and north of the Ohio river. This area would extend farther south were it not for the fact that the cargo approaches the country from the south, and so the Mississippi river and southern railroads from the coast become competing factors.

As New York was the pioneer in the early days of canal-building, so now it has again taken the lead along the way which others seem about to follow. Numerous canal schemes have

been agitated since the barge canal was begun and some of them have passed from the stage of agitation into that of preliminary surveys. Of these there are four in the region of the Great Lakes which are worthy of notice. If built, they will be in effect extensions of New York's barge canal and their efficiency will depend in large measure upon the barge canal, since it forms the outlet between them and the sea.

Four Proposed Canals

These four proposed canals are, first, the Lake Erie and Ohio River canal, which would join the Ohio river at Pittsburgh with Lake Erie, and for which complete surveys and estimates have been made by the states of Ohio and Pennsylvania; second, the Lake Erie and Lake Michigan canal, surveyed by the United States engineers and joining the heads of Lakes Erie and Michigan by a line only one-third the length of the present natural route, thus bringing Chicago, Milwaukee and Grand Rapids that much nearer to the eastern states and the ocean; third, the proposed improvement of existing canals in Illinois, which extend between Lake Michigan and the Mississippi river; fourth, a canal from the head of Lake Superior to the cities of Minneapolis and St. Paul.

The engineers who have made the plans for these canals either have been drawn from the barge canal corps or have studied New York's canal and adopted its ruling features and dimensions.

It seems scarcely necessary to call attention to the importance of these proposed canals—what it means, for example, to place Pittsburgh with its steel industries and the great twin cities with their grain and flour interests on a vast Lakes-to-Atlantic waterway system—nor to point out the vital position and the extended influence of the barge canal in this mighty chain of improvements.

Nor would the canals just mentioned constitute the entire system of internal waterways contemplated for

the middle and Atlantic states. The projects advocated by the Atlantic Deeper Waterways Association form a part of the whole vast scheme. These canals would give an inside passage along a large portion of our Atlantic coast. Thus the barge canal would become the connecting link between two great systems—the intra-coastal canals and the Great Lakes with their adjoining canals—and the supreme importance of this connecting link becomes very evident.

A Prosperous Territory

It is not generally known how important is the territory adjoining the barge canal as a region in which certain products originate and others are consumed. The original canals were responsible for the founding of a chain of cities and villages across the Empire state, the like of which does not exist elsewhere in the whole country. Directly upon New York's waterways of barge canal dimensions there are situated more than 30 cities, some 90 villages and many hamlets, while other populous communities are but a few miles away. A study of the state's population reveals the fact that nearly 75 per cent of the people live within two miles of the waterways. As New York's population is one-tenth that of the whole country, we see that about 7 per cent of the people of the United States are within a half hour's walk of the New York waterway system. From this we can see what it means to the state and to the country at large that the products of these 7,000,000 people and the supplies they need may have available a cheap means of transportation.

Before a congressional committee on transportation some years ago a man who was considered one of the best railroad authorities in the country made the statement that the Erie canal regulated freight rates on all roads east of the Mississippi. The chairman of this committee went still further, declaring in one of his speeches that the canal exerted an influence over the whole country, "from the interior of the Gulf States to the St. Lawrence river, and from the great plains of the eastern foothills of the Rocky mountains to the Atlantic ocean."

Four Great Terminals

There are four principal terminals of the barge canal system and the adjoining waters at each of these terminals are under the control of the United States government. At the western terminus of the Erie canal the Niagara river has been improved under federal authority to meet barge

canal requirements. It was expected that work at the mouth of the Oswego river, the northern terminus of the Oswego canal, would also be undertaken by the government, but as this has not been done, it has been decided not to wait longer, and accordingly the state is about to let a contract for this section. In the upper end of Lake Champlain, the northern terminus of the Champlain canal, considerable more work is very desirable, which it is anticipated the government will undertake to perform. In the Hudson river at the eastern terminus of the Erie and the southern terminus of the Champlain canal improvements of barge canal dimensions

Canal Cuts Distance

In the case of materials produced in the region of the Great Lakes and also somewhat to the west of them, as, for instance, the grain from the great belt covering the northern states and southern Canada, and also in the case of foreign goods reaching New York from the east, the area influenced by the New York barge canal is extended. Perhaps the importance of the barge canal as an essential link in the water route for this vast east and west traffic can be shown most strikingly by considering what happens to a shipment starting from the head of Lake Superior and going to Europe by way of the Mississippi. After it has gone 2,000 miles and reached the mouth of this river, it is still 4,500 miles from Liverpool, no nearer its destination than at the beginning, in view of the possible 4,500-mile water route by the Lakes, the barge canal and the Atlantic ocean.

are under way, but an agitation for a larger improvement has been in progress for several years and has now gained great impetus.

The projects closely connected with the barge canal which have already been approved by the army engineers and which need federal appropriations are, the improvement of Oswego, Rochester, Black Rock and Tonawanda harbors, the enlargement of the narrows of Lake Champlain and the dredging of the Hudson.

The mileage of waterways connected and the extent of territory influenced by the building of the barge canal are already great. Even now the 1,500 miles in the Great Lakes and the 800 miles of New York waterways form a mighty system. If the canals and improvements adjacent to the

Great Lakes and the Atlantic intra-coastal chain with its continuous navigation of 1,800 miles are eventually built, the area coming under the influence of the barge canal will indeed be vast.

New York's expenditures for contributing the important connecting link between other waterway systems have been very large and without precedent. That the federal government should do its utmost to make the barge canal supremely effective by providing the most suitable outlets in the waters under its control and thus render the canal a national asset of far-reaching influence, seems so self-evident and reasonable as scarcely to need expression in formal words.

Will Build Fast Ships

P. A. S. Franklin, recently appointed president of the International Mercantile Marine Co. plans to build four fast steamships for the American line. It is understood that the new liners will have to be constructed in the United States, as the British government has passed an act prohibiting the building of foreign vessels in Great Britain for 10 years after peace is declared.

Mr. Franklin said the plans call for oil-burning, quadruple turbine steamships of about 32,000 gross tonnage, with a speed of 25 knots or more. The American line, which is operating ST. PAUL, ST. LOUIS, NEW YORK and PHILADELPHIA at present, receives a mail subsidy of \$4 a mile for each mile traveled by the steamships out and home. This will have to be considerably increased, Mr. Franklin said, to put the new 25-knot liners in service between New York and Liverpool.

Ocean Freights Higher

Although limited to a few trades, a stronger demand for tonnage is evident in the ocean freight markets and rates have moved steadily upward on recent charters. The number of fixtures continues below the average, but with British steamers out of the market and many neutral bottoms, particularly Norwegian, chartered abroad, the vessels offering are few and hardly sufficient to meet the demand. The position of the market which a few weeks ago was in favor of the charterer has been reversed and the owner no longer has to seek for bidders on his vessel. Shipping men are uncertain as to whether the advance in rates will continue or be maintained, as the demand is limited in scope, and are unwilling to make any predictions concerning the course of the market under present conditions.

Trading is confined largely to French transatlantic net form boats, the rate

ruling at 90s, while corresponding strength is shown in the rate to the west coast of Italy and other Mediterranean ports. The trade in grain to the United Kingdom and other allied ports is practically dead, shipments being almost exclusively in the hands of the government and carried in requisitioned space on liners or requisitioned or chartered vessels fixed abroad. It was stated yesterday that the last rate on grain to the United Kingdom was 11s 3d, but in view of a nominal berth rate of 12d

grain was naturally not moving at that rate now.

A good demand for boats on time charter for American and Mediterranean trading is reported, and rates have stiffened somewhat. The rate for 12 months for the Mediterranean is firm, at from 42s 6d to 45s, while for American trading 35s to 40s is the rule. Owners show a decided preference for the latter trade and, in many instances, are unwilling to allow their ships to engage in trade with Europe.

Cunard Fleet Growing

THE consolidation of the Anchor line and the Donaldson line is regarded by shipping men as substantiation of an opinion held for some time that the Cunard Co. is seeking world-wide influence. The acquisition of the Donaldson line will bring to the Cunard a fleet of 15 vessels and will strengthen the company in its Canadian relations. The line's position in Canadian trade had already been improved through an agreement reached last spring with the Canadian Pacific, which gave it an additional service to the Dominion, its ships plying between Montreal and Avonmouth.

The services of the Cunard Co., with recent extensions through the control of new interests, will form a network covering all the most important trade routes of the world. The company regularly operates lines of ships between New York and Liverpool; New York, Falmouth and London; Boston and Liverpool; Boston and London; Montreal and London, and Montreal and Avonmouth, besides services to the Mediterranean, which have been partly interrupted by the war. Recently the purchase of the Watson Steamship Co., in connection with the Ellerman lines, has given it an interest in a joint service from Manchester to the Mediterranean and has indicated a community of interests between these two lines.

Through the Anchor and Anchor-Brocklebank lines, which have been under Cunard control for several years, the Cunard reaches out toward the Far East, these companies operating services to Gibraltar, Egypt, Bombay, Calcutta and Karachi. The Anchor line also maintains a New York-Glasgow service.

The most important expansion of the Cunard that has recently taken place was the purchase last spring of the Commonwealth & Dominion line, comprising services between London and Australia and New Zealand, and New York and Australia and New Zealand. Twenty-four ships, many of recent construction, with an aggregate gross tonnage of about 180,000 tons, were secured in this deal.

Recently the establishment of a working agreement between the Cunard and the Peninsular & Oriental lines was reported, but this has not been confirmed.

The Donaldson line will give the Cunard a South American service, some-

British admiralty and the services will not be normal until after the war. The view generally held is that the expansion of the Cunard is part of a broad movement toward consolidation of British shipping, but the possibility is recognized that it may be merely an evidence of war prosperity.

The following vessels are listed in Lloyds Register for 1916-17 as belonging to the Anchor line:

Steamer—	Built.	Gross tons.
Calabria	1901	4,376
Caledonia	1904	9,223
California	1907	8,669
Cameronia	1911	10,963
Castalia	1906	6,396
Circassia	1903	6,732
Columbella	1902	8,292
Elysia	1908	6,397
Italia	1903	4,806
Massilia	1902	5,112
Olympia	1902	5,138
Paladin	1913	3,26
Perugia	1901	4,348
Policastria	1907	4,594
Scindia	1900	5,160
Tarantia	1911	4,754
Tiberia	1913	4,880
Transylvania	1914	14,315
Tuscania	1914	14,348

The fleet of the Donaldson line includes the following vessels:

Steamer—	Built.	Gross tons.
Athenia	1904	8,668
Cabotia	1900	4,369
Cassandria	1906	8,135
Clutha	1891	3,420
Lakonia	1899	4,656
Letitia	1912	8,541
Marina	1900	5,204
Mercuria	1899	3,982
Ormidale	1893	3,560
Orthia	1896	4,125
Tarthenia	1901	5,160
Saturnia	1910	8,611
Tritonia	1905	4,445
*Alconcla	1906	4,298
*Crauley	1903	4,644

* Ships belong to the Anglo-Newfoundland Development Co., Ltd., owned by the Donaldson line.

In addition to the ships belonging directly to the Anchor line, a fleet of 15 vessels, averaging more than 5,000 gross tons, owned by the Anchor-Brocklebank line, is associated with it, as are also the five ships of the Erie & Western Transportation Co., with headquarters in Philadelphia.

Adding to Ship Yards

Excavations have been started on improvements to the Cleveland and Lorain yards of the American Ship Building Co. A one-story addition, 60 x 120 feet, will be added to the machine shop at the Cleveland plant. In Lorain, additions of 60 x 120 feet and 40 x 110 feet will be made to the forge and boiler shops. It is expected that all three buildings will be ready for occupation by the early part of January. The Crowell-Lundoff-Little Co., Cleveland, drew up the plans and has been awarded the contract. It will be recalled that the American Ship Building Co. recently completed an extensive construction program in Cleveland.

Submarine Causes Suit

Charles C. Hardwick, acting for Burr & Hardwick, lace and veil dealers, has filed a suit in the supreme court of New York against the Oceanic Steam Navigation Co. for goods lost when the steamer ARABIC was sunk by a German submarine. The complaint alleges that on Feb. 18, 1915 the German government proclaimed the waters around the British Isles within the war zone and that all vessels of hostile nations would be sunk on sight without notice. On Aug. 15, 1915, the plaintiff contracted with the defendant to ship goods worth \$834.64 to this country from Liverpool. ARABIC, on which the goods were shipped, was in the war zone off Fastnet when she was sunk by one or more torpedoes fired by a submarine. The complaint says that the sinking was not due to the neglect of the plaintiff, but to the recklessness, imprudence and wanton conduct of the defendant.

The plaintiff alleges that the recklessness and imprudence consisted of the following: The steamer didn't follow a prudent course, but one known to be infested with submarines; she didn't go at proper speed, but reduced speed, making her an easy target for hostile submarines; she proceeded through the war zone by daylight instead of under cover of darkness; she had not sufficient lookouts to warn her of the approach of submarines, and she failed to mount one or two small cannon for defensive purposes. The plaintiff sues for the value of the goods.

thing that had previously been lacking in the Cunard group.

The full effects of the additions to the Cunard control will probably not be felt until peace is restored, it is said. Many of the vessels owned by the company are under requisition to the

Four Vessels Founder in Big Gale

Lives of 51 Lost in Storm—Splendid Work of Great Lakes Interests
in Promoting Safety Keeps Down Number of Accidents This Year

ON FRIDAY, Oct. 20, Lake Erie was swept by a gale that carried to their graves 50 members of the crews of four ships that foundered. The gale was of unusual severity, several captains who encountered its full force asserting that the wind blew at a higher velocity than in the great storm of November, 1913.

The number of those lost in the storm was 51, one man being washed from the deck of a barge. The great storm three years ago took the lives of 248 and caused the loss of 17 vessels. The storm of Oct. 20 brought the total number of vessels lost this season up to 11, the lives lost being 71.

Safety on the Lakes

The 1916 record, deplorable as it is, in many ways is a notable tribute to the vigorous safety campaign conducted in recent years by the vessel owners of the Great Lakes. In both individual cases and through combined efforts, such as the Lake Carriers' Association, vessel owners for years have used every opportunity to impress upon their men that the safety of human life is of the greatest importance. Captains are told that their responsibility in regard to the lives of the crew is always to outweigh any responsibility for the safety of the ship, or for the quick discharge of cargo.

In the face of the present season's casualties, it is of value to recall the

arduous conditions under which the Great Lakes fleet has operated this year. The traffic has been the greatest in the commercial history of the inland lakes. Every sound vessel has been in service. With the railroads at both upper and lower lake ports, giving excellent dispatch, the relative time spent in port has been smaller than formerly. This condition means that the fleet has spent relatively more time out on the lakes and connecting channels than in earlier years.

With the maximum fleet in commission and with the maximum number of vessels always on their runs between ports, the opportunities for accidents were much more numerous this season. That the actual accidents were really fewer in number than in past seasons when the opportunities were less, is a testimonial to the splendid co-operation between the vessel owners in their safety campaign and the men on the ships.

The first vessel reported lost in the storm was the steamer MARSHALL F. BUTTERS, which was carrying lumber from Midland, Ont., to Cleveland. A few hours later came word of the foundering of the schooner D. L. FILER, en route from Buffalo to Saugatuck, Mich. The whaleback steamer JAMES B. COLGATE was next reported lost, followed a short time later by the finding of lifeboats and lifebelts which revealed the loss of the steamer MERIDA. COLGATE was en route from Buffalo to Ft. Wil-

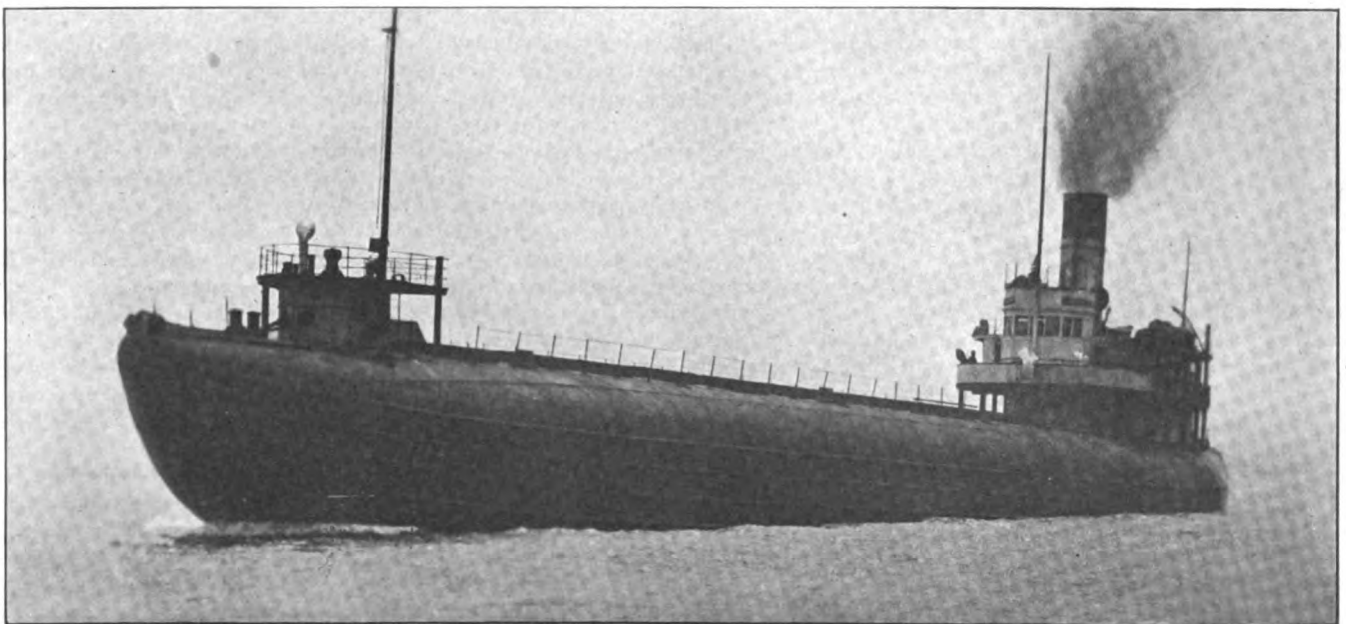
liam, Ont., while MERIDA was bound from Ft. William to Buffalo.

MARSHALL F. BUTTERS was a small wood steamer of 376 gross tons, built in 1882. She foundered 12 miles southeast of the Southeast shoal light. During the storm, water was discovered in the hold of the vessel and Capt. Charles E. McClure ordered the pumps manned and at the same time he changed the course for Lorain, O. The crew could make no headway against the rising flood of water and after an hour Capt. McClure ordered the lifeboats lowered. The water had reached the engine room.

Effect Brilliant Rescue

A brilliant rescue of the endangered crew was made by the steamers FRANK BILLINGS and FRED G. HARTWELL. BILLINGS, which is of the Hutchinson fleet, and HARTWELL, of the Tomlinson fleet, were forced to maneuver carefully and skillfully in order to rescue the crew, five of whom were in one lifeboat and eight in another. BILLINGS hove to windward and managed to quiet the seas with oil until those in the larger lifeboat reached HARTWELL. Two of those in the other lifeboat jumped into the water and were also picked up by HARTWELL. The three others were taken aboard by BILLINGS. The rescued highly praised the excellent seamanship displayed by the captains of BILLINGS and HARTWELL.

Unlike BUTTERS, all of whose crew



STEAMER JAMES B. COLGATE, FOUNDERED OCT. 20, 1916

were rescued, six of the seven men aboard the schooner. D. L. FILER were lost. Capt. John Mattison, after clinging for 12 hours to a mast, was rescued by the passenger steamer WESTERN STATES. FILER, in company with the schooner INTERLAKEN, was in tow to the steamer TEMPEST and was left at anchor off Bar Point, while the steamer and INTERLAKEN went to Toledo. FILER was a wood vessel, 399 tons gross, and was 40 years old.

After being pounded severely by the storm, the schooner finally sank at 9 o'clock Friday night. She had been dragging her anchors for some time and just before she sank, Capt. Mattison ordered the crew to take to the rigging. The six members of the crew climbed the forward mast, which broke off an hour later. One of the crew managed

at the time that that company's parent concern, the United States Steel Corporation, was formed. In August, 1915, she was sold to the Standard Transit Co. She was 308 feet long and had a carrying capacity of 3,300 tons. She was the first steel vessel lost this year.

The belief prevails in Great Lakes marine circles that one of the hatches of COLGATE became loosened, allowing water to fill the hold. The whaleback steamers are regarded as unsinkable and a loosened hatch is the only satisfactory explanation broached for her foundering.

Capt. Grashaw states that they ran into the storm late Friday afternoon and by 8 o'clock noticed that the ship had begun to settle forward. Capt. Grashaw, who had been promoted from first mate only two weeks ago before,

tonnage was 3,329. Her crew numbered 23. The ship was last sighted by Capt. Wassey, of the steamer BRITON a short distance from the point where BUTTERS sank.

The number of fatalities due to the storm reached 51 when a sailor on the barge ISAAC L. BELL was washed off the deck. BELL was at anchor a short distance from FILER and successfully rode out the storm.

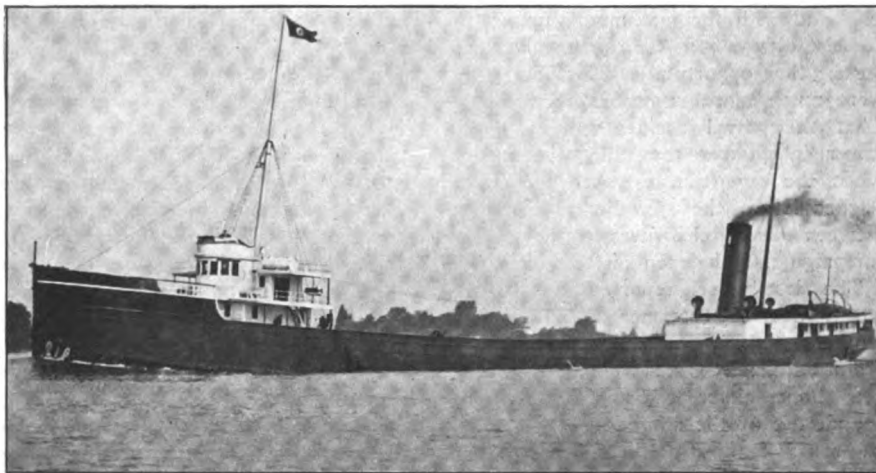
The 11 vessels lost this season include nine steamers and two barges. In addition to BUTTERS, COLGATE and MERIDA, the steamers S. R. KIRBY, CITY OF MIDLAND, PANTHER, TOPEKA, SARONIC and ST. IGNACE were lost. The barges lost were FILER and ROB ROY. Twenty lives were lost when KIRBY sank. COLGATE and MERIDA were steel vessels, KIRBY a composite one, and the others were wood. Six of the vessels foundered, three were destroyed by fire and two were in collisions.

How Safety is Promoted

One safety measure that was instituted by the Lake Carriers' Association, and which has done much to increase safety on the Great Lakes is the establishment of inside and outside courses for vessels crossing Lake Huron. Northbound vessels take the inside course, which brings them into excellent position for making the mouth of St. Mary's river. Southbound vessels take the outside course, captains establishing their position at the southern end of the lake through soundings. These courses have been approved by most of the fleet managers and were quite generally observed this season.

Special precautions are always taken in the fall to conserve lives and property. The navigation of all ships is entirely in the hands of the masters. Extra caution is urged in the fall, as the following circular issued by the Great Lakes Protective Association through J. S. Ashley, chairman of the advisory committee, indicates:

"Navigation during the remaining months of the year is attended by the greatest dangers of the season and the ability of the navigator is taxed to the utmost to avoid accidents and to safeguard the crew and the ship. Added to the ordinary dangers to which navigators must ever be alert, we have fogs and thick weather on practically every trip; sharp fluctuations in the water levels in shallow channels, especially in Lake St. Clair and at Bar point; severe gales and snow storms occurring generally with very little warning; and with practically every vessel in commission by reason of the extraordinary movement of ore, grain and coal, a greater congestion of vessels in the rivers and channels is experienced, all of which are dangerous to navigation,



MERIDA WAS LOST WITH ALL HANDS

to swim to the aft mast, where Capt. Mattison helped him to climb to safety. After a night of hardship and anxiety, the men were sighted by WESTERN STATES. The sailor succumbed and dropped into the water, but the captain held on to the rigging until a boat from WESTERN STATES, manned by a volunteer crew, managed to come near. The almost exhausted man summoned sufficient strength to battle his way through the high seas to the boat.

Whaleback is Lost

A similar story of a brave and successful fight against apparently hopeless odds was revealed when the car ferry MARQUETTE & BESSEMER No. 2 reached Conneaut, O., Sunday, Oct. 23, with Capt. Walter Grashaw, of the whaleback JAMES B. COLGATE. He was the sole survivor of the 22 men on board COLGATE when she ran into the storm. He was rescued off Rondeau, Ont., after being buffeted about for 34½ hours on a life raft.

COLGATE was built in 1892, her gross tonnage being 1,713. She was taken over by the Pittsburgh Steamship Co. in 1901,

realized that the ship was doomed and just as she started to go down, he jumped into the water. He came up near a life raft and clambered aboard. The raft turned over as he tried to climb aboard, but his second attempt to get on the raft was successful. Two of the crew also were on the raft.

The raft was 3 x 9 feet and for three hours the three men struggled to keep it afloat. When it finally tipped over, one of the crew had disappeared. Capt. Grashaw clung to a life line and dragged the second man back on the raft. At day dawn, they were again swept off the raft and again Capt. Grashaw dragged the second man, who was weak from exhaustion, to safety. A short time later this man was washed off for the third and final time.

After a day and night of suffering, during which time the captain, flat on the raft, kicked and wriggled some semblance of warmth into his benumbed body, the car ferry sighted the raft and hauled the exhausted man aboard.

No survivor of MERIDA escaped to relate the story of her final hours. She was built of steel in 1893. Her gross

especially during thick, foggy weather.

"This letter is, therefore, to remind you of the rules we have formulated for the safeguarding of your crew and vessel, and it is expected of the navigator that these be carefully observed.

"Vessels should be given plenty of buoyancy to meet possible gales; cargoes should be carefully loaded and trimmed; hatches should be properly secured and the ship made seaworthy before starting on the voyage and have plenty of fuel for emergencies; weather conditions should be observed and reports obtained from the weather bureau whenever possible.

REMEMBER

"You are expected, above all else, to bring your crew and ship safely into port."

The attention paid by Great Lakes vessel owners to safe navigation was emphasized last year when Secretary Redfield of the department of commerce wrote to President Livingstone of the Lake Carriers' Association, urging that every attention be given to safety in fall navigation. President Livingstone replied by pointing out the measures already taken and reciting that the danger of overloading modern Great Lakes freighters was eliminated by the limited draft in the connecting channels and by the side-hopper construction which made the vessels practically self-trimming. He also called attention to a circular issued last year by President Couly of the Pittsburgh Steamship Co., the lakes' largest fleet, in which masters were reminded that they "must not neglect any of the rules laid down safeguarding the crew and property under their charge. Use your own best judgment in navigation with the intention of getting into port safely, even though by doing so you may be a little longer in accomplishing it."

Late Marine Patents

Copies of any one of the following patents can be obtained by sending 15 cents in stamps to Siggers & Siggers, patent lawyers, National Union Building, Washington, D. C., by mentioning *The Marine Review*:

- 1,202,197—Life-preserver. John W. Lippincott, Little Rock, Ark.
- 1,202,198—Armor for vessels. Morris Lowy, New York.
- 1,202,207—Life-preserver. Kurt Nebel, Chicago.
- 1,202,255—Canopy-top for boats. Newton E. Williams, New Britain, Conn.
- 1,202,519—Apparatus for securing lines to sunken vessels. David W. Hively, Seattle, Wash., assignor of one-half to Enos R. Cade, Seattle, Wash.

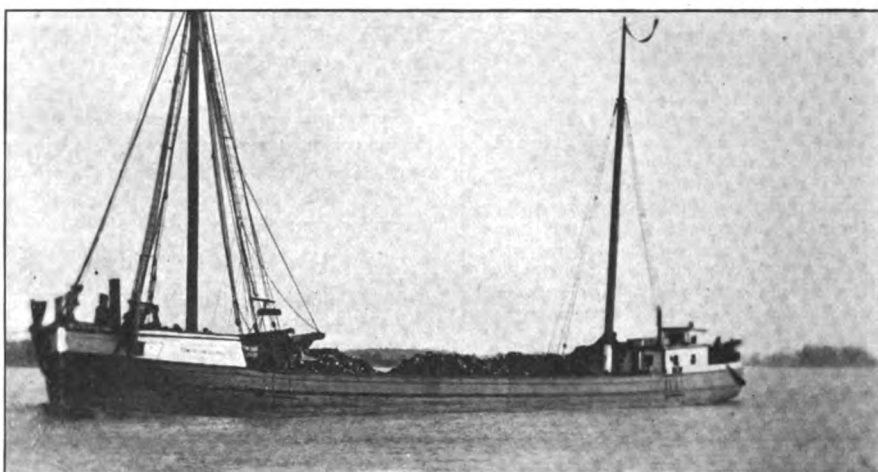
California's Keel is Laid

Work Finally Started on Big Battleship Which Was Authorized 19 Months Ago

THE old battleship OREGON, built on the Pacific coast, was the guest of honor Oct. 25, at the keel laying of the superdreadnaught CALIFORNIA at Mare Island navy yard. OREGON came from San Francisco earlier in the day with the California congressional delegation, and some 800 civilian guests.

CALIFORNIA was authorized 19 months before but was delayed because the secretary of the navy refused to accept the bids of private yards. She should be ready for launching Jan. 1, 1918, and in commission the following year. She will have a displacement of 32,000 tons and a speed of 21 knots. Lessons of the

ship ROYAL ARROW, has been successfully launched at the plant of the New York Ship Building Co., Camden, N. J. The sponsor was Mrs. N. J. Pluymert, wife of the general manager of the Standard Transportation Co., New York, owners of the new vessel. ROYAL ARROW is similar to STANDARD ARROW, launched a few weeks ago at the same ship yard. The recently launched vessel has a carrying capacity of more than 4,000,000 gallons of oil in bulk. She is 485 feet in length, 62 feet, 3 inches beam and 39½ feet depth of hold. Triple expansion engines will develop a speed of 11 knots. The vessel was built under



HEROIC SCENES ACCOMPANIED THE WRECK OF D. L. FILER

European war, especially those taught by submarine and torpedo attack, have been analyzed by the United States navy constructors in the design of CALIFORNIA. They believe she will be able to make port in spite of numerous and several torpedo wounds.

The 1,022 bluejackets who will man the battleships under 58 officers, however, probably will divide their admiration between this, her dozen 14-inch guns and some of the many electrical devices, such as the electric potato peeler in the galley, the electric-driven ice cream freezer, or the electric dish washing machine with a capacity of 1,000 dishes per hour.

Use of electricity on CALIFORNIA begins with her main engines, driven by motors supplied with current by generators turned by steam turbines of 28,000 horsepower. There will be practically no work done on shipboard directly by steam.

The second largest bulk oil carrier under the American flag, the steel steam-

the supervision of chief surveyor Nabareth, of Lloyds Register of Shipping. The vessel will carry oil from California to the Orient.

October Lake Levels

The United States Lake survey reports the stages of the Great Lakes for the month of October, 1916, as follows:

Lakes.	Ft. above mean sea level.
Superior	603.72
Michigan-Huron	580.56
Erie	571.90
Ontario	246.06

Lake Superior is 0.16 foot lower than last month, 0.99 foot higher than a year ago, 1.12 feet above the average stage of October of the last 10 years, 0.16 foot above the high stage of October, 1869, and 2.14 feet above the low stage of October, 1879. During the last 10 years the October level has averaged about the same as the September level and 0.2 foot higher than the November level.

Lakes Michigan-Huron are 0.20 foot lower than last month, 0.78 foot higher

than a year ago, 0.13 foot above the average stage of October of the last 10 years, 2.38 feet below the high stage of October, 1876, and 0.96 foot above the low stage of October, 1911. During the last 10 years the October level has averaged 0.2 foot lower than the September level and 0.3 foot higher than the October level.

Lake Erie is 0.43 foot lower than last month, 0.07 foot lower than a year ago, 0.20 foot below the average stage of October of the last 10 years, 1.80 feet below the high stage of October, 1885, and 1.10 feet above the low stage of

Japan Shy of Material

Great Britain's prohibition of exports of ship building materials is reported to have hit the Japanese ship yards pretty badly. Since this rule has been enforced, these yards have been put to great inconvenience and have had their contracts very much delayed. Even though the British government has relaxed its regulations somewhat—for the special benefit of Japan—the firms have not been able to take advantage of the concession because of the very high prices now prevailing in the United Kingdom for all kinds of steel and iron materials. So they have had to look elsewhere for their supplies, and they have come to the United States. Here, too, they have experienced difficulties, as the demands of the belligerents are such that the supplies available for new customers are very limited. At most, Japanese builders found that they could not obtain from the states much more than half the amount which they had been in the habit of importing each year from Great Britain.

In 1915 they imported materials to the value of 13,000,000 yen, and this year they would have taken much more. Instead, they are getting a good deal less, and, as they have many important orders for naval and mercantile vessels, serious delays are inevitable. Their own steel and iron works are endeavoring to increase their output, and in time they will do so very largely, but nothing they can do at present will make up for the great scarcity of imported materials.

October, 1895. During the last 10 years the October level has averaged 0.2 foot lower than the September level and 0.3 foot higher than the level in the month of November.

Lake Ontario is 0.63 foot lower than last month, 0.89 foot higher than a year ago, 0.32 foot above the average stage of October of the last 10 years, 1.75 feet below the high stage of October, 1861, and 2.39 feet above the low stage of October, 1895. During the last 10 years the October level has averaged 0.4 foot lower than the September level and 0.2 foot higher than the level in the month of November.

More Ship Building Work for U. S. Yards

The bureau of navigation of the department of commerce announces that the steel merchant vessels, building or under contract to be built in private American ship yards on Oct. 1, 1916, numbered 417, of 1,454,270 gross tons. On June 30, 1916, Lloyds Register reported 439 steel merchant vessels of 1,540,118 gross tons under construction in British ship yards. The American returns cover contracts on which work has not begun, while Lloyds returns cover only ships on which construction has actually begun.

Although the British yards have increased their merchant work, the delivery of engines and machinery is slow, and at present the completed outputs of American and British yards are about equal. In September American yards finished 19 steel merchant vessels of 46,608 gross tons and made new contracts for 47 steel merchant vessels of 208,686 gross tons, about half of which are for Norwegian owners.

The month's new contracts equal all the merchant steel tonnage in the United States building or under contract on July 1, 1913, and exceeds that building or under contract on July 1, 1914.

How Work is Divided

The following table shows the distribution of this work among the several builders of steel vessels in the United States reporting merchant vessels under contract or under construction:

Ship yards.	Merchant Construction, Oct. 1, 1916.	Gross Number.	Tons.
American Bridge Co., Ambridge, Penn., and Trenton, N. J.	102	52,100	
American Shipbuilding Co., Cleveland	27	103,400	
Bethlehem Steel Co., Sparrows Point, Md.	12	74,893	
Baltimore Dry Docks & Shipbuilding Co., Baltimore	10	37,600	
Bath Iron Works, Bath, Me.	3	1,600	
Chester Shipbuilding Co., Chester, Penn.	14	67,700	
Fore River Shipbuilding Corporation, Quincy, Mass.	13	87,800	
Great Lakes Engineering Works, Detroit	19	74,130	
Great Lakes Towing Co., Cleveland	4	376	
Harlan & Hollingsworth Corporation, Wilmington, Del.	15	63,959	
Howard Shipyards Co., Jeffersonville, Ind.	5	2,950	
J. F. Duthie & Co., Seattle	5	26,850	
Manitowoc Shipbuilding Co., Manitowoc, Wis.	11	17,450	
Moore & Scott Iron Works, Oakland, Cal.	7	35,600	
Newport News Shipbuilding & Dry Dock Co., Newport News, Va.	14	97,573	
New York Shipbuilding Co., Camden, N. J.	26	133,804	
Pennsylvania Shipbuilding Co., Gloucester, N. J.	10	65,000	
Pusey & Jones Co., Wilmington, Del.	13	12,150	
Seattle Construction & Dry Dock Co., Seattle	10	56,700	
Skinner & Eddy Corporation, Seattle	10	58,640	
Standard Shipbuilding Corporation, New York	6	28,800	
Staten Island Shipbuilding Co., Port Richmond, N. Y.	4	5,941	
Sun Shipbuilding Co., Philadelphia	2	12,400	

Texas Steamship Co., Bath, Me.	4	26,000
Toledo Shipbuilding Co., Toledo, Ohio	8	20,600
Union Iron Works Co., San Francisco	28	176,028
Williamette Iron & Steel Works and Northwest Steel Co., Portland, Ore.	7	39,900
William Cramp & Sons Ship & Engine Building Co., Phila.	10	64,200

Book Review

Brown's Nautical Almanac, edited by James R. Brown; paper, 627 pages, 8 $\frac{3}{4}$ x 5 $\frac{1}{2}$ inches; published by James Brown & Son, and furnished by *The Marine Review* for \$0.50 net.

Although English publishers are working under difficulties these days, the

Canadian Yards Busy

The ship building yards of Canada and British Columbia are active. Considerable difficulty exists in obtaining raw materials, as many of the plants which would normally aid in supplying these are now devoted exclusively to the work of turning out war munitions. In spite of these conditions, a large number of ships are now under construction and good progress is being made.

In British Columbia 25 vessels are either being built or projected, only three of these being steel ships. The big demand at present is for the lumber carrying trade, and the opinion is held that the development of a fleet of wood sailers is particularly desirable for this industry. Eight of the wooden vessels have been contracted for by the Canada West Coast Navigation Co., and, although none of these is yet completed, four have already been chartered. The average carrying capacity of the wooden ships is 1,500,000 feet of lumber. One of the steel ships is being built for the Japan trade and the other two for general freight purposes. All these ships are expected to be ready for service within a year or 18 months.

These developments are attributed to the British Columbia shipping bill, under which builders are advanced 55 per cent of the construction cost, to be paid back with interest in five years, while a subsidy on the operation of ships is provided.

1917 edition of *Brown's Nautical Almanac* is filled with interesting and valuable data. With the exception of the absence of the usual maps, which, owing to the restrictions of the censorship, are necessarily omitted, the volume measures up to its usual high standard. The first part of the book is devoted to an astronomical ephemeris for 1917 and the first three months of 1918. This is followed by a section given up to nautical tables and methods. In addition the book contains a harbor and dock guide, daily tide tables, and other miscellaneous information.

What the Government is Doing

Rulings on Marine Matters

Improvements to Waterways

Hints to Navigators

Bids for Many Warships are Opened

BIDS for most of the vessels in the government's naval preparedness program were opened at Washington on Nov. 1 and Oct. 25. Offers to build four battleships, price within \$11,500,000 each, and 20 torpedo boat destroyers, price within \$1,200,000 each, were opened by the navy department on Oct. 25. Despite the substantial increase in the cost of ship building, the department was successful in receiving bids for all classes of these vessels within the cost limit set by congress, notwithstanding the fact that but a few yards submitted offers. Bids came from the New York Ship Building Co., the Fore River Ship Building Corporation, the Newport News Ship Building & Dry Dock Co., the California Ship Building Co., the Seattle Construction & Dry Dock Co., the Bath Iron Works and the Union Iron Works.

The William Cramp & Sons Ship & Engine Building Co. offered to take a contract for one of the battleships upon a commission basis, the government guaranteeing a commission of 10 per cent upon the actual cost price of the ship. This bid was explained by reason of the abnormal increase in the cost of materials the price of which apparently has not as yet reached its maximum.

While the Fore River company submitted bids, it explained that it had contracts out for only 50 per cent of the material necessary for the construction of these vessels. If the cost of materials continues to increase at the rate it has been increasing within the past few months, it was said the cost of these materials will be double what it now is before the vessels are completed. The Fore River company further explained that it had felt compelled to refuse to accept private contracts in large numbers within the past few months, but it had reserved space in its yards to take care of a part of the business of the navy department.

It is virtually certain that all four ships, which will be called COLORADO, MARYLAND, WASHINGTON and WEST VIRGINIA, will be awarded to private concerns and that the government itself will not construct any of these craft

or the 20 destroyers, for which offers also were received.

Prices for the battleships quoted ranged from \$10,060,000 to \$11,475,000, as against the department's limit for hull and machinery of \$11,500,000. A study of the bids is now in progress. None of the bidders offered figures for the steam electric drive system of propulsion preferred by the navy department. Offers in this connection provided only for the construction of the

New Norwegian Fleet

Seven new steamers, able to make the long voyage from Christiania, Norway, to San Francisco via the Panama canal in 30 days, equipped with oil engines, will begin operations soon, according to Fritz Olsen, son of F. Olsen, a prominent Norwegian ship owner, who reached San Francisco recently to represent his father's project in this port. The vessels, he said, would have a carrying capacity of 10,000 tons each and would probably operate on weekly sailing schedules. Three of the steamers, Mr. Olsen said, were ready for service and the others were nearing completion in Norwegian and Danish yards.

ship, the government to supply the driving machinery. For this reason quotations on electric drive ships were approximately \$500,000 lower than similar figures for all steam drive. Indications are that the electric drive ships will be ordered. Under the appropriation act the department has funds available to complete them under the bids.

While completion in 36 months has been asked, 39 months was the lowest estimate made, most of the bidders fixing 40 months as the minimum time required because of the crowded conditions of the industry.

The department received 24 offers for the construction of the 20 destroyers, contracts for which are to be let. The limit of cost is fixed at \$1,200,000, which again is a decided increase over the limits for the last similar ships contracted for. Bids ranged from \$1,150,000 to \$1,195,000 each, and the time of de-

livery from 22 to 28 months. The Bath Iron Works, Bath, Me.; the Union Iron Works, San Francisco, and the Fore River Ship Building Corporation were the principal bidders, making offers for four, six and eight vessels, respectively. The Cramp company also bid for four boats. The contracts will be awarded among these four concerns, as the only other bidder, the Seattle Construction & Dry Dock Co. exceeded the limit of price.

Bids to build four scout cruisers and 29 submarines were opened Nov. 1. For the first time in history, the United States was offered an opportunity to build submarines after the designs used by an European government. This license bid was offered by Schneider & Co., of Paris and New York. This company offered to license the United States to build in government yards submarines under the plans of those built for the French government at the Creusot works.

The Fore River Ship Building Corporation and the Seattle Construction & Dry Dock Co. were the only two bidders for the four scout cruisers. The Union Iron Works, San Francisco, offered to build two of the cruisers upon a basis of the cost of construction plus a profit of 15 per cent. The New York Ship Building Co. submitted a letter in which it said it found it could not offer to build the vessels within the limit of \$5,000,000 each set by congress.

The bid of the Seattle company was \$4,975,000 and it offered to build only one cruiser, to be completed in 30 months, and based upon the department's specifications and designs. This bid carried the condition that the required material could be obtained.

The figure of the Fore River company was \$4,900,000 for each of two cruisers, the first to be completed in 33 months and the second in 36 months. This company also made its bids conditional upon the current cost of labor and material, the government to assume any increased cost, or to get the benefit of any decreased cost. The accounting of the company would be submitted to

the federal trade commission and the navy department.

The Lake Torpedo Boat Co., the California Ship Building Co., and the Electric Boat Co. offered to build the two 800-ton submarine boats, the limit of cost of which was fixed by congress at \$1,200,000 each. The Lake Torpedo Boat Co. offered to build one of these submarines, if it is awarded a contract for the coast defense submarines for which it also bid. The price quoted was \$1,195,000. The Electric Boat Co. offered to build one of these submarines at \$1,168,000 or both at \$1,148,000 each, deliveries to be made within 26 and 27 months. If constructed upon a modified design, this company would build one of these submarines at \$1,189,000, or both at \$1,167,000 each.

These same two companies offered bids on the 27 coast defense submarines, for which congress fixed the cost limit at \$700,000 each. The Electric Boat Co. would build 24 of these submarines of 570 tons displacement each at amounts ranging from \$697,000 to \$835,000 each, according to design, or these same submarines of 530 tons displacement at amounts ranging from \$668,000 to \$812,400 each, according to design. Deliveries would begin in 18

months after letting the contracts.

The Lake Torpedo Boat Co. offered to build six of these submarines of 485 tons' displacement at amounts ranging from \$692,000 to \$694,000 if constructed according to the department designs, or at \$689,000 each when constructed according to modified designs. Deliveries would begin within 21 months.

Schneider & Co., of Paris, said that they could not submit lump-sum bids because of the difference in cost of American labor and materials. It said, however, it would lease to the United States government the designs of submarines it had built for the French at the Creusot works to be built in United States government yards. The license fee asked was for Class A, \$68,000 for the first submarine, or \$38,000 each for more than one; Class B, \$57,000 for the first, or \$33,000 each for more than one; Class C, \$70,000 for the first, or \$40,000 each for more than one.

The California Ship Building Co. offered to build five of the submarines of 495 tons displacement at \$698,000 each on the department's plans, or for \$696,000 on modified plans. It also offered to build five submarines of 485 tons displacement at \$693,000 each. Deliveries would begin in 23 months.

On cargo, both routed and unrouted, held for a longer period than 35 days, storage for the first 30 days will be charged at the rate of 3 cents per bill-of-lading ton per day, and thereafter at the rate of 5 cents per bill-of-lading ton per day.

2. All cargo routed and unrouted, shall be removed in the order of arrival.

3. No storage will be charged on cargo for local delivery for a period of 72 hours from the time the steamer has completed cargo, but on any cargo not accepted by consignees within that time, a charge of 3 cents per 100 pounds per day, or \$5 per car per day or fraction thereof, at the option of the company, will be made, the minimum charge to be 15 cents.

Re-Examinations Allowed

The steamboat-inspection service, in conjunction with the public health service, in a recent circular letter issued instructions to supervising and local inspectors of the steamboat-inspection service, that in cases where an applicant for license, as an officer in the deck department of vessels, has been rejected for visual defects, or where an applicant for certificate of service as able seaman has been rejected for visual or other physical defects, and any such applicant desires to be re-examined by surgeons of the public health service, he may do so upon request to the local inspectors to whom he made application for license or certificate.

Government Rulings

The following is a summary of rulings recently made by the steamboat-inspection service, relating to the transportation of certain articles on steam vessels carrying passengers:

Non-inflammable metal polish may be transported on steamers carrying passengers and may be used as stores on passenger and pleasure steamers. Inquiry presented by the George Wm. Hoffman Co., Indianapolis, Ind.

Murrays Bed Bug Doom may be transported on steamers carrying passengers under the same conditions as refined petroleum, but shall not be used as stores on passenger or pleasure steamers. Inquiry presented by the Radio Mfg. & Sales Co., Baltimore.

The following described article may be transported on steamers carrying passengers:

Pluvinox roofing cement. — Inquiry presented by the Hydrex Felt & Engineering Co., New York City.

President Suspends Act

PRESIDENT WILSON'S ruling in extending the suspension of section 2 of the act approved Aug. 18, 1914, entitled "An Act to provide for the admission of foreign-built ships to American registry for the foreign trade, and for other purposes," is as follows:

1. That the provisions of the law prescribing that the watch officers of vessels of the United States registered for foreign trade shall be citizens of the United States, are hereby suspended so far and for such length of time as is herein provided, namely: All watch officers now employed on foreign-built ships which have been admitted to United States registry under said act who, heretofore, have declared their intention to become citizens of the United States and watch officers on such ships who, within six months from this date, shall declare their intention to become such citizens, shall be entitled to serve on foreign-built ships so registered until the time shall have expired within which they may become such citizens under their declarations, and shall be eligible for promotion upon any foreign-built ship so registered.

2. That the provisions of law requiring survey, inspection and meas-

urement, by officers of the United States, of foreign-built ships admitted to United States registry under said act are hereby suspended so far and for such length of time as is herein provided, namely: The said provisions shall not apply to any such foreign-built ship during the period of one year from this date provided the secretary of commerce is satisfied in the case of any such ship that the ship is safe and seaworthy and that proper effort is being made to comply with the said provisions.

New Orders at Panama

The captain of the port at the Panama canal has issued the following orders:

Whenever in the judgment of the receiving and forwarding agent, or port captain, it is deemed advisable to shift any vessel in order to accommodate other vessels, or for any other reason, shifting will be made by direction of the captain of the port, and the towing and other expenses thereby incurred will be charged against the vessel so shifted.

1. No charge will be made for the storage of transfer cargo held on piers or in cars for 35 days from the date same is ready for delivery.

On the Coasts, Lakes and Rivers

What's Doing and Who's Doing It

Lively Doings Along the Gulf Coast

By H. H. Dunn

THE Kansas City Missouri River Navigation Co., through its New Orleans agent, D. D. Thompson, states that barge service, long maintained by this company on the Missouri river between Kansas City and St. Louis, has been extended to New Orleans. The tug *ADVANCE*, towing two steel barges with 1,200 tons of general cargo, was the first to arrive in the Crescent City. A. W. Mackie, general manager of the company, came to New Orleans to arrange for return cargo. This is the first serious attempt to revive river commerce between Kansas City and New Orleans.

The steamer *ASPEN* is now in the service of the Swedish Transatlantic line between New Orleans and Christiana and Gothenburg. *ASPEN* is of 5,000 tons register and took a full cargo of general merchandise. The Transatlantic line will maintain direct service from Calcutta to New Orleans, thence to the Swedish ports, returning to Calcutta.

Of the 307 vessels that came into New Orleans harbor from Oct. 1 to Oct. 21, only 88 were steamships, and not all these were engaged in transatlantic trade. This indicates that the dangers of war are sending an increasing number of sailing vessels to New Orleans. Practically every ship which clears from New Orleans leaves a quantity of "shut-out" cargo on the wharves, so great is the demand for bottoms.

Practical illustration of the utility of water transportation over inland channels was given here late in October, when the steamer *PATRICIA* and barges brought 11,000 bags of rice to New Orleans from Abbeville, La. Shippers found it impossible to secure sufficient freight cars from the Southern Pacific or other lines serving Abbeville territory. Their recourse to the barges and steamer proved very satisfactory.

The Alabama Transportation Co. has been organized at Mobile to run freight and passenger steamers on the Tombigbee and Alabama rivers. It also will operate a line of vessels between Mobile, Cuba and Central American ports. The incorporators are J. H. Quil, Martin van Heuvel and C. R. Little.

H. C. Murnan, Memphis, is building a set of marine ways on the east bank of Mobile river, at Mobile.

The four sections of the Ollinger-Bruce dry docks at Mobile, which were driven ashore during the July hurricane

have been floated. The tug *GULFPORT*, of the Gulf & Ship Island railroad, and a large barge, both of which were in the dry dock when it went ashore, were floated with the docks. Neither tug, barge nor dry dock was injured.

Lighterage system is to be established in New Orleans harbor, according to Hayden W. Wren, president of the board of port commissioners. Eight flat-topped barges or lighters are to be installed soon.

HENRY R. MALLORY, largest ship in the United States coastwise service, made its first trip from New York to Galveston under the flag of the Atlantic, Gulf & West Indies Steamship line, Oct. 25. This is the first of nine new steamers to be added to the A. G. & W. I. fleet. Two more are being built.

The American Sugar Refining Co. has chartered eight vessels to carry 25,000 tons of sugar from New Orleans to eastern refineries. The first vessel for this contract, the largest of its character in the history of New Orleans, loaded Nov. 7 at the Southern Pacific docks.

The full-rigged Norwegian ship *GUNDA*, Barbadoes to Gulfport, Miss., which was given up by her agents as lost, reached the Mississippi port Oct. 22, after a stormy trip across the gulf. *GUNDA* sailed from Aarhus, Denmark, July 7.

The river packet *STACKER LEE*, of the Lee line, struck a fixed snag in the Mississippi river about eight miles above Memphis, Oct. 22, and sank in 15 feet of water. There was no loss of life, but the boat, worth about \$50,000, may be difficult to raise. She carried cotton, cottonseed and cement.

J. W. Somerville, Gulfport, Miss., has let the contract for building a schooner 176 feet long, 35-foot 1-inch beam, and a depth of 14 feet 3 inches. The capacity of the new schooner will be 480,000 feet of lumber, practically that of *J. E. DU BIGNON*, which was lost in the July storm with 440,000 feet of lumber, and which the new schooner will replace.

The four-masted schooner *SALEM*, owned by J. R. Hanify & Co., Portland, Ore., has been sold to J. M. Scott & Bros., Mobile, for \$88,000. *SALEM*, which is one of the finest wood schooners afloat, has a capacity of 1,000,000 feet of lumber. She is now on her way from Portland to Mobile and is due

to arrive in January. She will be put into the South American trade.

Two 165-foot seagoing barges have been completed by the Favre ship yards, Gulfport, Miss., for the Gulfport Transportation Co. Three others of similar size will be built during the next three months.

Embargoes against freight for American and Canadian destinations, enforced for several months by the Morgan steamship line at Galveston, were lifted Nov. 4, according to an announcement by H. M. Wilkinson, general agent of the line at the Texas port. Freight for foreign destinations other than Canadian will not be accepted when moving through on bills of lading. The embargoes, it is explained, were made necessary because of unprecedented offerings of freight for coastwise movement from Galveston for New York.

Capt. John Thomas Bowes, steamer pilot for nearly 35 years on the Mississippi, and the man who took the old warship *MAINE* out of New Orleans on her fatal voyage to Havana, died Oct. 23, at his home in New Orleans. He was 60 years old and was a native of Plaquemines Parish, La. His son, Capt. William T. Bowes, is a pilot on the river.

On the Chesapeake

By Hollis F. Bennett

The Baker Whiteley Coal Co. has sold its ocean tug *BRITANNIA* to foreign owners. It is reported that she has been purchased by the British admiralty for mine sweeping work. *BRITANNIA* was built by the Maryland Steel Co. in 1899. She is 125 feet, 5 inches long, 25 feet beam, 14 feet depth of hold and 10½ feet draught. Her engines are triple expansion 14½, 23½ and 39 inches in diameter and have a 28-inch stroke. She has one Scotch boiler, 13 feet 9 inches diameter and 11½ feet long with 165 pounds working pressure and on her trials made 12 knots.

W. F. Spice of the firm of Gustavus & Co., ship brokers, Baltimore, has purchased the Great Lakes tug *CHASE S. OSBORNE* for \$107,000. *CHASE S. OSBORNE* is having condensers installed at Montreal before coming around to the Atlantic to assume her new duties.

Norwegian interests have purchased the American - Hawaiian steamship *GEORGIAN* at Baltimore and renamed

her KALSARLI. The vessel is of 6,606 tons register and is 414 feet long. She was built by the Maryland Steel Co. in 1910. KALSARLI will fly the Norse flag.

The American barkentine KREMLIN, in port at Baltimore, has been sold by the John S. Emery Co., Boston, to Smith & Terry Co., New York, for \$55,000. KREMLIN was built in Bath, Me., in 1890 and is 161 feet long and registers 786 tons.

The third tanker built for Christoffer Hannevig by the Baltimore Dry Docks & Ship Building Co. was launched Oct. 28. The vessel was christened HOLDEN EVANS after the president of the Dry

Docks company by his daughter Miss Iris Evans.

Alfred W. Gieske has purchased the steam yacht KAJERUNA in New York and has added her to the fleet of the Baltimore yacht club.

The Bethlehem Steel Co., Sparrows Point, Md., turned the steamship HELEN over to her owner, the A. H. Bull Steamship Co., Oct. 28. HELEN is the eighth steamship built this year by the steel company and is the third this year for the Bull company. HELEN is 338 feet long, 46½ feet beam, 26 1/3 feet depth of hold and has a deadweight capacity of 4,700 tons.

other recurrent conditions and would open for early development, in a commercial way, the lower sections of Philadelphia.

The Sun Ship Building Co., Chester, Pa., has been awarded contracts by the Shawmut Steamship Co. for constructing two 10,000-ton freight steamers. The vessels are to be delivered in two years.

The new bulk oil carrier PEARL SHELL, built for the Shell Co., of California, by the Harlan & Hollingsworth Corporation, Wilmington, Del., has left for New York, to load her first cargo.

After a successful trial trip in Chesapeake bay, the new tanker BRAMELL POINT, named after the new refining plant now building for the Vacuum Oil Co. on the Delaware river, has left for New York to load a cargo of oil for Europe.

News From the Delaware

By Joseph Fenerty

THE Delaware river is at present the greatest ship building center of the world, according to a report recently issued by the department of commerce. The total tonnage under construction exceeds that of the principal British ship building districts, such as Glasgow, Newcastle and Belfast. Ninety ships with a tonnage amounting to 419,213 gross are now being built at Delaware river plants.

Control of the Delaware Ship Building Co., Seaford, Del., has been secured by the Hannevig & Johnson Co., New York. The property comprises 12 acres and has a marine railway. Under the new management it is purposed to repair and build wood vessels. As a result of the change, A. D. Cummins, Philadelphia, president of the Delaware company, will resign.

After a successful trial trip over the government course, off Rockland, Me., the torpedo boat destroyer WILKES has returned to the Cramp ship yards, Philadelphia, for final adjustment of machinery before being turned over to the navy department.

The new passenger and freight steamer GEORGIANA WEEMS has been launched at the plant of the Harlan & Hollingsworth Corporation, Wilmington, Del. Miss Mary Weems was sponsor. The vessel was built for the Baltimore & Carolina Steamship Co. She is 255 feet long, 39 feet beam and 25 feet in depth of hold. She will ply between Baltimore and Georgetown, S. C.

In command of Captain Ockelman, the new steamship SUNOIL, recently completed at the Cramp ship yards, Philadelphia, for the Sun Oil Co., Chester, Pa., has begun her maiden voyage to Tampico. The vessel, which has a carrying capacity of 10,000 tons of oil in bulk, cost about \$800,000. The owners were offered \$1,500,000 for her before she left the ways.

W. R. Grace & Co., New York, have awarded contracts to the Cramp company, Philadelphia, for building two additional steamships of 6,300 tons capacity each. They are intended for Pacific

and South American trade. Two steamships are now under construction at the Cramp yards for the New York concern.

The first direct steamship communication between Philadelphia and South America was established on Oct. 17, when CAROLYN, of the newly-organized Philadelphia & South America Corporation's line, steamed from Philadelphia. Formal ceremonies marked the departure. Addresses were made by Howard B. French, president of the chamber of commerce, which has been mainly responsible for the establishment of the new line; W. Freeland Kendrick, receiver of taxes, who represented Mayor Smith; George S. Webster, director of the department of wharves, docks and ferries, and E. J. Cattell, city statistician. Dr. William P. Wilson and Dudley Bartlett represented the commercial museums. Representatives of the railroads having terminals in Philadelphia were also present. CAROLYN carried a general cargo. EVELYN, a sister ship, left Philadelphia about the middle of November. After that, a monthly freight service will be operated. The new concern has been pledged a sufficient amount of freight to make the line a success. A number of firms not affiliated with the chamber of commerce have asked for freight rates to South American ports.

The new ways in the ship yard of the Pusey & Jones Co., Wilmington, Del., are being rapidly pushed to completion. The company will enter the business of building steel ships of a much larger tonnage than heretofore. Four contracts from Norwegian shipping interests have been awarded the concern.

Another attempt to induce the Pennsylvania legislature to make an initial appropriation of \$500,000 toward the removal of Horseshoe shoal and the straightening of the channel in the Delaware river at Horseshoe curve, was recently planned at an enthusiastic meeting of various commercial interests of the port. The project includes the complete elimination of the shoal and the construction of a channel along the Pennsylvania shore. This projected channel would minimize the existing dangers to navigation from fog, ice and

News From Frisco

By A. A. Willoughby

According to figures compiled by the marine department of the San Francisco chamber of commerce, one-fourth of the ship building at present being conducted in the United States, is carried on in Pacific coast plants. Further, it is said, that 67 per cent of this work is concentrated in two plants on San Francisco bay, the Union Iron Works and the Moore & Scott Iron Works. On the Oakland side of the bay, where the Moore & Scott yards are located, more than \$50,000,000 worth of work has been contracted for. Of the several plants on the Oakland side, the new plant of the Union Iron Works is making a strong showing having at present, in excess of \$30,000,000 worth of work under contract, sufficient to keep the plant at full capacity for the next two years. The entire estimated tonnage being constructed on the Pacific coast is 325,378, of which 219,158 is under way about San Francisco bay. The Moore & Scott yards are showing great activity. On the first of the year, there were 400 men employed. At present there are 1,800 working in three shifts.

The motorship CHILE which left San Francisco the latter part of October for Copenhagen, carried 8,000 tons of barley, one of the largest cargoes shipped out this season.

STAR OF SCOTLAND, bound from Karluk, was the last of the Alaskan salmon packers to make San Francisco for the season, arriving early in October.

Along Puget Sound

By F. K. Haskell

Formation of the Oregon Ship Building Corporation with a capital of \$500,000, backed by the Smith & Watson Iron Works, insures the establishment of a steel ship construction plant at Portland, Ore. Contracts closed provide for the building of four 8,800-ton steel freighters for Norwegian interests with a total value in excess of \$4,000,000.

Capt. Albert T. Stream, well-known Pacific coast mariner, died recently in

Hoquiam, Wash., at the age of 70. For 40 years he had been captain of deep sea and coastwise vessels.

For the purpose of making a strong protest against a new order from the government supervising inspector of steam vessels which calls for certain iron work in the fire rooms of wood vessels, Puget sound steamboat men have recently forwarded their complaints to Washington. Under the new ruling, it is declared, all wood vessels will have their fire rooms encased in iron sheeting of such nature and arrangement as to protect the wood from danger of fire. Boat operators declare that if this order is carried out they will have to put their boats out of commission as in a number of instances it is impossible to make the change without practically rebuilding the boats.

Plans for an original motorship to be built for the Oregon Navigation Co. have been brought out by Geo. E. Hardy of the Heath Ship Building Co., Portland, Ore. The vessel will be 288 feet long overall, with a length between perpendiculars of 276 feet, beam of 48 feet and molded depth of hold, of 27.4 feet. The vessel will cost \$325,000.

With two 250-foot auxiliary-powered wooden hull schooners nearing completion in its Harbor island plant and the keels laid for two others the past week, the Washington Ship Building Co., Seattle, has decided to begin construction of a fifth vessel, in November and a sixth in December. Still others are contemplated. The company plans to launch a vessel every 30 days for an indefinite period.

Capt. Charles H. Fuller, Portland, Ore., has recently had his new boat davit tested. The invention has several novel features. The main one is that the launching of a lifeboat can be performed by one man. After the passengers climb into the boat and are seated, every operation, from the raising of the boat from its chocks to its final delivery into the water can be done by one man. The davits consist of a pair of arms which swing inboard or outboard in an arc of 90 degrees either way. The lifting cable leads from the boat over sheaves to the drum, and the swing of the arms and the raising of the cable are controlled by a crank at either davit. A shaft connects the two davits so that the operation of raising or lowering goes on simultaneously at both ends. A man at either end can control both davits.

Boston Harbor

By Geo. S. Hudson

An offer of \$4,000,000 for steamships WILLIAM A. MCKENNEY and FELIX TAUSSIG by the English government to the Crowell & Thurlow Steamship Co., Boston, has been refused. The contract price for the two 8,000-ton ships was \$1,040,000. The first-named boat was launched at Newport News, Va., last month; TAUSSIG will follow the first of the year.

An unusual character is that of the ship EDWARD SEWALL to load coal at New York for Galveston, the vessel having recently arrived from Buenos

Aires. Placing of square-rigged craft in coastwise trade demonstrates scarcity of tonnage.

Schooner JACOB M. HASKELL, Captain Mercer, is bound from Boston for Sekondi, African west coast, with a cargo, including 220,000 gallons of New England rum, on which \$110,000 was paid in freight. A return cargo of mahogany is expected at \$45 per ton.

Harbor tug B. G. PURDY has been launched by Green, Chelsea, Mass., for the Purdy Tow & Waterboat Co., Boston. The boat is 64 feet long, with an engine of 150 horsepower and carries a crew of three.

Boston schooner EDWARD H. COLE has been chartered to carry coal from Baltimore to Santander at \$14 per ton and coke at \$21 per ton.

Tug JOSEPH O'RIORDAN, formerly city of Boston tug CORMORANT, has been sold to the Boston Towboat Co. by the J. P. O'Riordan Contracting Co.

Boston barkentine JOHN S. EMERY has been chartered to load lumber at

Charleston, Mass., for Buenos Aires at \$25 per 1,000 feet.

Captain Eugene O'Donnell, supervising inspector of the Boston district, has rendered a decision relative to length of towing hawsers on tows traversing Nantucket and Vineyard sounds, as follows: "With regard to length of hawsers when condition of wind and sea do not permit of towing on hawsers of 75 fathoms or less, because of the danger of parting and loss of life or damage to property, you are advised under such circumstances a tow with hawsers in excess of 75 fathoms does not constitute a willful violation of the regulations and in such cases no action will be taken against licensed officers in charge of such tow."

Schooner SENATOR SAULSBURY has been sold by Boston owners to Captain James Foster, who will use the vessel as a trader to the West Indies.

Boston steamship BYLAVL has been chartered by the United States & Brazil Steamship Co. for \$40,000 per month to run between New York and Brazilian ports on a six months basis.

Busy Days on Great Lakes

By A. A. Eiben

FIGURES compiled by R. A. & W. M. Williams, Duluth, show that receipts of hard and soft coal at that port up to Nov. 1, of the present season, totaled 8,236,699 tons, against 6,999,792 tons to Nov. 1, last year, a gain of 1,236,907 tons. Soft coal showed a gain of 1,462,417 tons and hard coal a loss of 225,510 tons.

The 600-foot freighter D. M. CLEMON, building for the Pittsburgh Steamship Co., Cleveland, was launched at the Lorain yard of the American Ship Building Co., on Oct. 28. CLEMON was named for D. M. Clemson, president of the Carnegie Natural Gas Co., Pittsburgh, and will go into commission next spring.

Joseph Colson, mate of the barge S. D. WARRINER, who had sailed all his life on vessels of the Hanna fleet, died at Ashtabula on Oct. 25.

Dredging in the river west of West Water street bridge at Milwaukee was started recently. The river is to be widened at that point.

The steamers F. G. HARTWELL and H. A. BERWIND, of the Mutual Steamship Co., G. A. Tomlinson, Duluth, manager, were sold recently to the Headwaters Steamship Co., Harvey H. Brown, Cleveland, president. Both vessels were built in 1908 and are in the 10,000-ton class. This deal makes a total of four vessels of the Tomlinson fleet sold since last fall, the steamers WILLIAM LIVINGSTONE and HARVEY D. GOULDER having been disposed of earlier.

CLEVELAND, the first ocean-going vessel to be constructed at the head of the lakes, was launched from the yard of the Superior Ship Building Co., Su-

perior, Wis., on Nov. 4. CLEVELAND will be operated by a Norwegian company. Two additional vessels will be built at the Superior yard.

Stocks of grain at Chicago on Oct. 31 were reported as 27,145,000 bushels. These figures show a considerable gain over the Oct. 31, 1915, figures, which were 7,393,000 bushels.

Both boilers in the wooden steamer MECOSTA, owned by the General Transit Co., Cleveland, will be replaced during the coming winter, with a view to increasing the steam pressure.

The steamer HURLBURT W. SMITH loaded 330,000 bushels of grain at the new Northwestern elevator at Milwaukee on Nov. 1. This cargo was the first loaded at the new elevator and incidentally, also, the largest that ever left the port of Milwaukee. Containers for 600,000 bushels are being added to the capacity of the elevator, bringing its total capacity to 1,600,000 bushels.

The wreck of the old car ferry SHENANGO, which burned and sank in the outer harbor at Conneaut several years ago, was recently removed by the dredge MAUMEE, of the United States engineer department. Work on the removal of this wreck had been in progress for about six months, and the spar which marked the wreckage for a number of years has now been removed.

The steamers FRANK H. PEAVEY and GEORGE W. PEAVEY, belonging to the fleet of the Reiss Steamship Co., Sheboygan, Wis., will be reconstructed during the winter at the yard of the Manitowoc Ship Building Co., Manitowoc, Wis.

Red Hot Tips From the Trade

Pertinent Suggestions and Personal Gossip

THE ice machine, shown in the accompanying illustration, is manufactured by the Peerless Ice Machinery Co., Chicago. It is claimed that this machine, which works automatically, contains all the refrigerating factors of the ordinary refrigerating machine except the expansion coils and brine tanks. The automatic machine takes up considerably less space than is occupied by the brine refrigerating apparatus. In the smaller models of lesser capacity the motor is generally placed on top of the machine. In a bulletin devoted to the subject of ice-refrigerating machinery, the company shows how the ice machine may be adapted to various lines of business. The booklet also contains various tables of sizes, weights, dimensions and outputs. The dimensions of the machine in the illustration are 42 x 32 inches, and 59 inches high. It weighs 5,875 pounds.

The American Screw Propeller Co., Philadelphia, designers of propellers by the Dyson method, states that during the first eight months of the existence of this company propellers have been designed or ordered designed for 91 vessels of various kinds, including 21

bulk oil steamers, 18 cargo and passenger steamers, four tugs, six private yachts and 42 small craft such as motor boats, speed cruisers, hydroplanes, etc.

New Steering Gear

The Hyde Windlass Co., Bath, Me., recently designed a new type of electro-hydraulic steering gear, in which electric motors in duplicate furnish power to specially-constructed hydraulic pumps, which actuate hydraulic rams. The latter are connected to the rudder cross-head. This type of steering gear has been designed primarily for installation on the scout cruisers, battle cruisers and battle ships provided for in the new naval schedule. Later the company expects to put these steering gears on the market for use in merchant vessels.

The Hyde Windlass Co. also has developed a new type of cargo winch. The intention was to make as nearly "fool-proof" a machine as possible and as a result, the new winch is of exceedingly compact construction. A departure from the usual construction is the use of reverse valves instead of links. The company has delivered about 75 winches and has orders for about 175 more.

The Hyde company recently secured the exclusive rights to manufacture the McGregor hydraulic rudder control in this country. This device was developed and in the past has been manufactured exclusively by McGregor's Port Glasgow Engineering Works, Glasgow, Scotland.

Large Bronze Propellers

The Hyde Windlass Co., Bath, Me., recently cast some exceedingly large propellers. About a year ago, a 4-blade propeller, 19 feet 6 inches in diameter, was turned out for the steamship *CHIPANA*, owned by W. R. Grace & Co. This propeller was cast in manganese bronze and the casting weighed 26,000 pounds in the rough and 24,500 pounds after being finished. The company has just completed a 4-blade manganese-bronze propeller, 18 feet in diameter, which will drive a 12,000-ton vessel owned by the Isthmian Steamship Co. This casting weighed 20,000 pounds in the rough and 26,000 pounds of metal were melted to pour it.

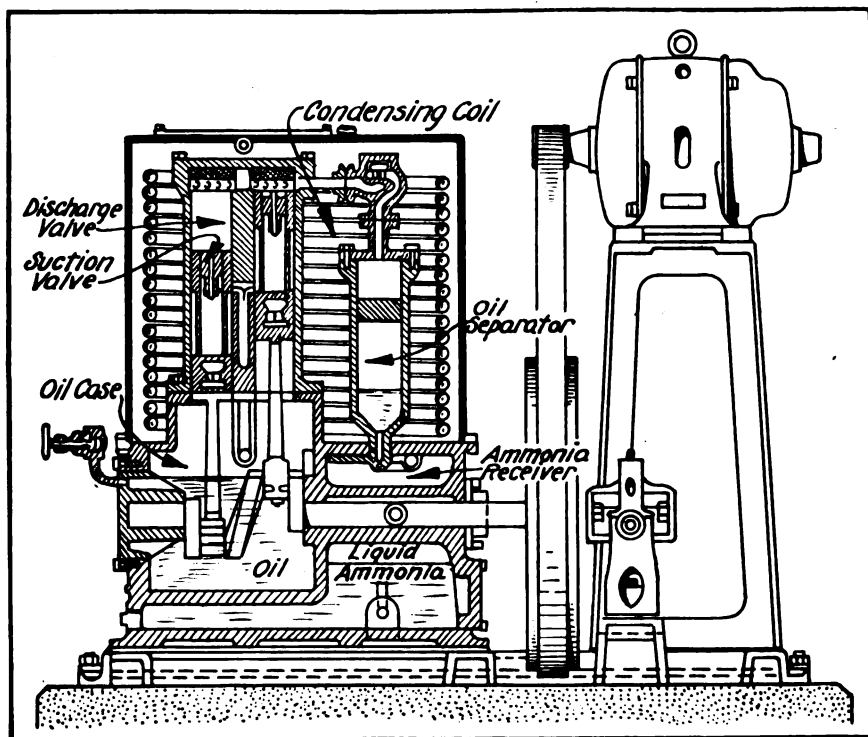
New Vessel Broker

The Chicago Steamboat Exchange, W. K. Greenebaum, manager, has opened offices at 350 North Clark street, Chicago, for the purpose of engaging in a general vessel brokerage business, specializing on Great Lakes steamers. A number of transfers have already been effected through the efforts of this company.

The Eckliff Automatic Boiler Circulator Co., Detroit, Mich., recently appointed Paul H. Coop as western representative, with office in the Hobart building, San Francisco, Cal. Mr. Coop is well known on the west coast, having successfully handled several engineering projects.

James Guthrie announces the opening of an office in the Erie building, Cleveland. Mr. Guthrie will engage in consulting marine engineering, specializing on problems of lake navigation.

DETROIT, barge from San Juan, P. R., sunk in the Delaware river off Philadelphia, has been pumped free of her cargo of 250,000 gallons of molasses by the wreckers, the Merritt-Chapman Derrick & Wrecking Co. The work of raising the vessel has started.



SECTIONAL VIEW OF 5-TON ICE-MAKING MACHINE SHOWING MOTOR MOUNTED ON FRAME



MARINE REPAIR STEAMER "ROBERT J. CLOSE"

Equipped With

Electric Welding Machine—Gas Welding Machine—Air Compressors—Electric Forges—Electric Lathes—Electric Drilling Machine—Electric Grinding Machine—Electric Punch and Shears—Electric Bolt and Pipe Machine—10-Ton Derrick

At Your Service Day or Night

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SUPERIOR, WISCONSIN

Builders and Repairers of Ships of all types for
GREAT LAKES and SALT WATER SERVICE.

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We Build
Steel Ships

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Any Size



Steamer George F. Baker in Our New Concrete Dock at South Chicago

Dimensions of
Dry Dock

	Feet
Length -	734
Width:	
At Top -	103
At Bottom -	88
Depth -	22½

We Operate the Largest Graving Dock on Lake Michigan
Complete Facilities for Rapid Repair Work
Shops and Dry Dock at South Chicago

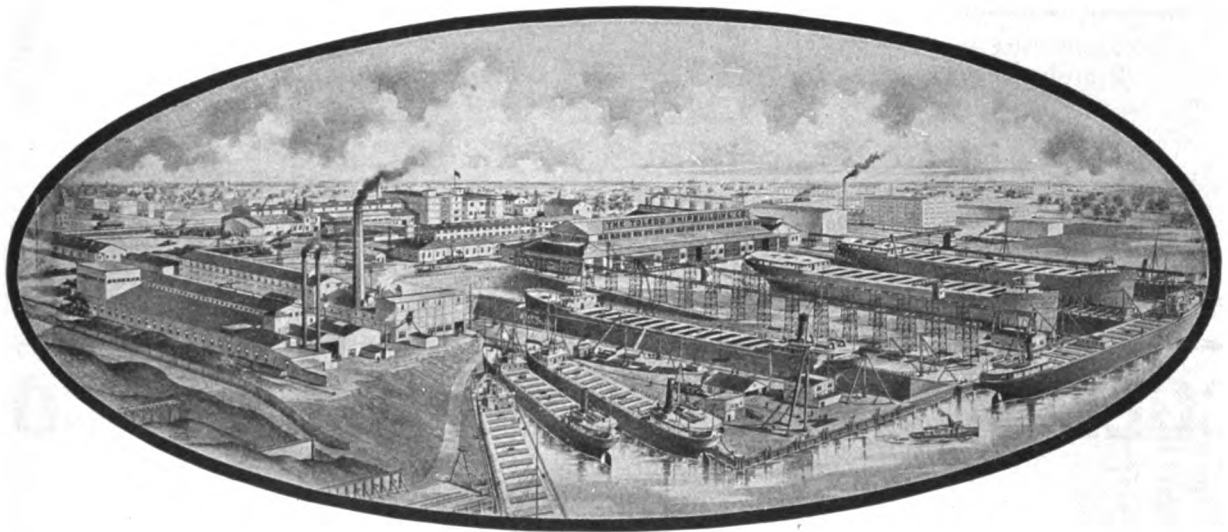
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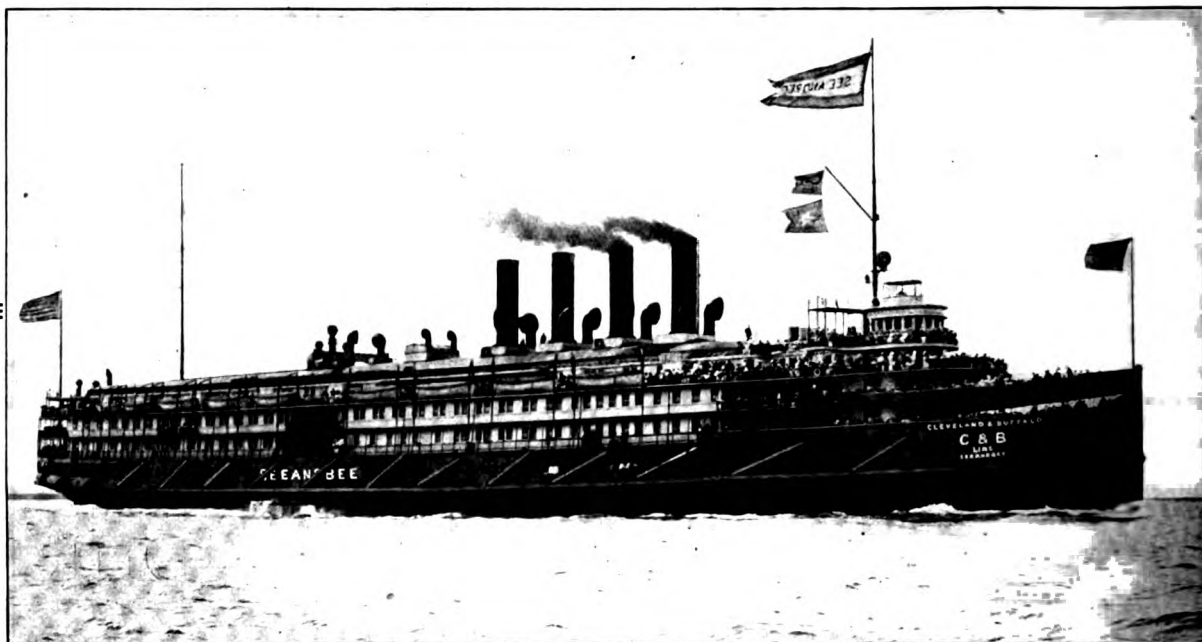
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 Builders of *Metallic Life Boats and Clark Patent Metallic Life Rafts.*

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Steel Shipbuilding Plant at Wyandotte, Michigan. First-class equipment for making hull and machinery repairs.

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Owners who are contemplating the construction of new vessels, of any type whatever, will find this system of construction most advantageous and suitable for all trades.

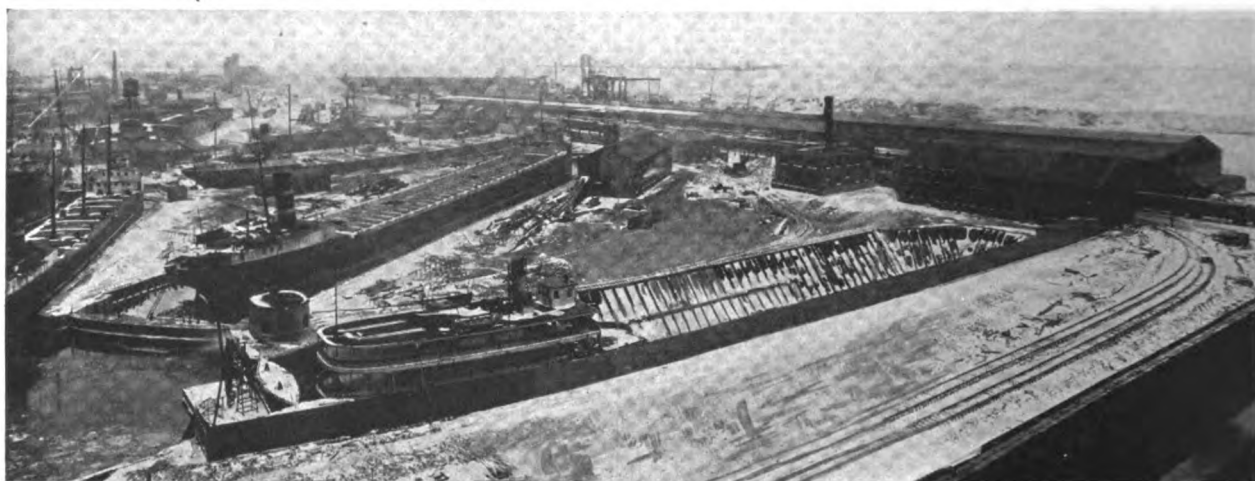
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We have two shipyards offering every facility for the repair of both steel and wooden vessels. South Yard Dock is 450 feet long on keel blocks; 460 feet over all; 60 feet width of gate and 16 feet over sill. West Yard Dock is 312 feet on keel blocks; 45 feet width of gate and 12 feet over sill. Rudder pit in each dock. Electric light for night work.

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Designers and Builders of

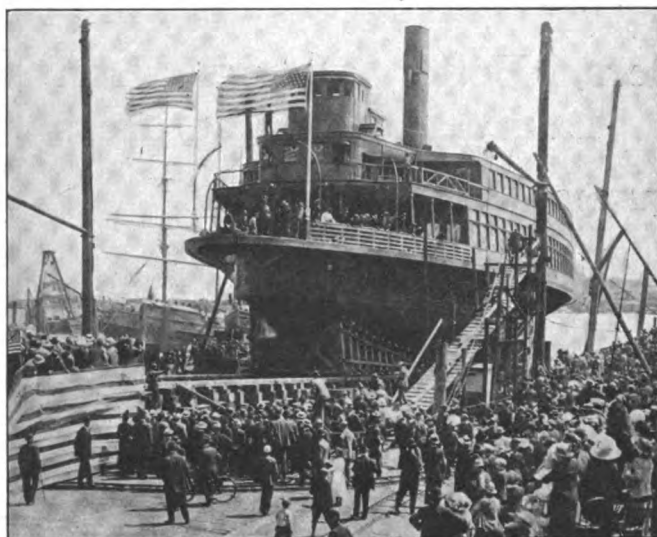
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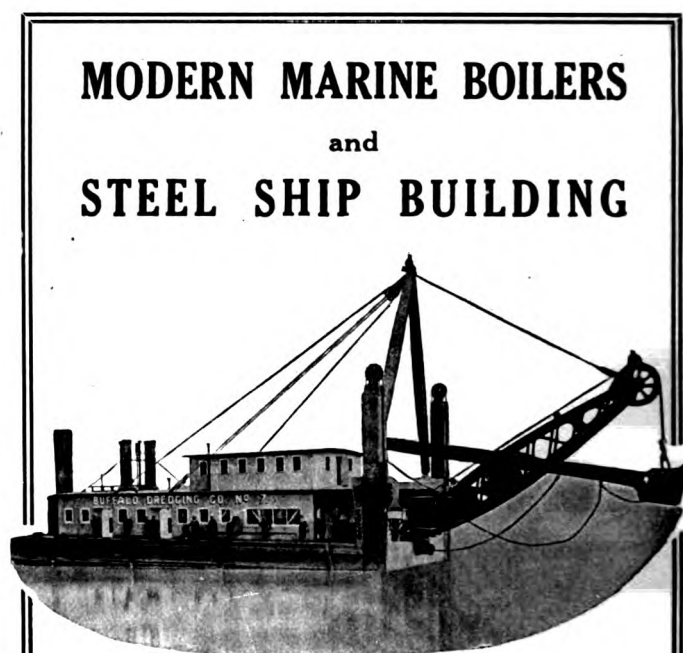
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MODERN MARINE BOILERS and STEEL SHIP BUILDING

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Particular Attention Given to
High Speed Requirements
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Our methods will save you excessive dry dock charges!

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We can handle anything that floats up to a 200 foot length, 40 foot beam, 12 foot draft.

We are now soliciting and booking orders for winter work. We employ a force of 75 men who have at their disposal every modern convenience including a complete mill for getting out material; a large up-to-the-minute electric derrick; a great number of electric drills, etc. All work is thoroughly guaranteed, and we keep our promises.

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For repairing Hulls, Boilers and Engines for large and small vessels, tugs, power boats and yachts.

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OUR DRY DOCKS SAVE TIME

Two Docks, coupled with Complete Shop Facilities, cut repair periods to a minimum

	Upper Dock	Lower Dock
Length on Keel Blocks, feet	600	437
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Draft Over Sill at Low Water	22½	22½

A COMPLETE SHIP BUILDING PLANT

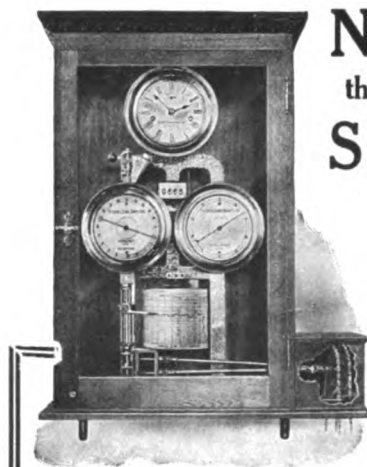
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Gives the mileage sailed, and shows the exact speed per hour on a dial, recording it on a chart for every minute of the trip.

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MECHANICAL AND ELECTRICAL SHIPS TELEGRAPHS



Rudder Indicators

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Electric Whistle Operators

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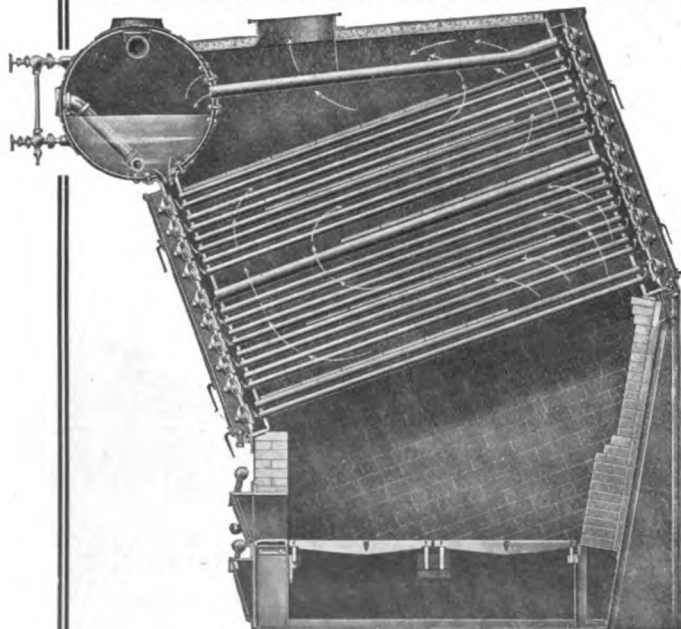
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The Charles Ward Engineering Works
CHARLESTON, WEST VIRGINIA
MARINE ENGINES RIVER STEAMERS

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**LAUNCHES
DREDGES**

**SCOWS
TUGS**

Our Marine Ways and Saw Mill enable us to give exceptional service in rebuilding and heavy repairing of all kinds



SPARE'S MANGANESE BRONZE PROPELLERS

Will save you hundreds of dollars in fuel costs each year

Write for Particulars

We make propellers of all sizes. 10 inches to 20 feet in diameter

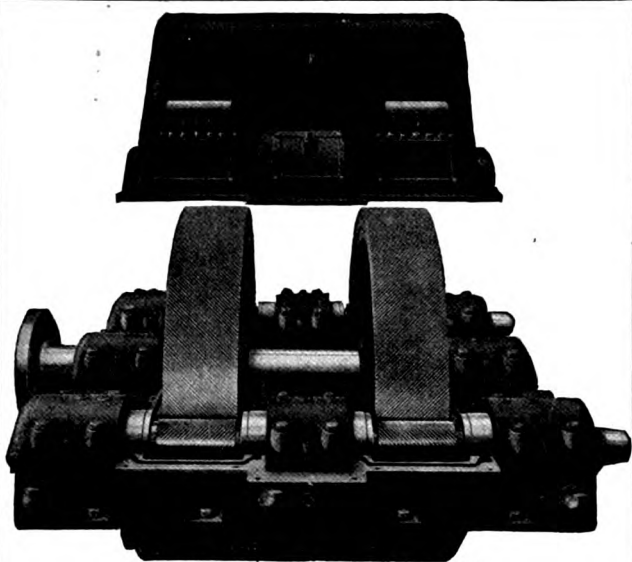
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STANDARD MOTOR BOAT PROPELLERS

AMERICAN MANGANESE BRONZE COMPANY
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The double-helical speed-reducing gear for steam turbine service was first introduced by De Laval in 1894.

At present over 6500 De Laval Double-helical Speed-Reducing Gears are in successful operation.

De Laval Gears are built by highly skilled workmen, from the best materials, and with equipment developed and improved by over 20 years of experience.

All factors entering into the design have been chosen after long experience under practical operating conditions, and all parts are made on a limit gage, interchangeable basis.

The De Laval Double-helical Speed-reducing Gear is not an ingenious idea based upon imperfectly developed theories, but an accomplished fact.

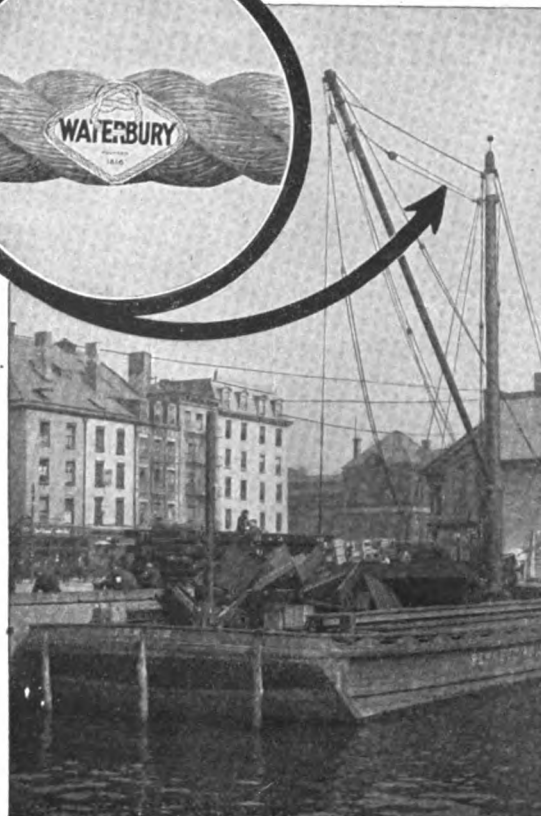
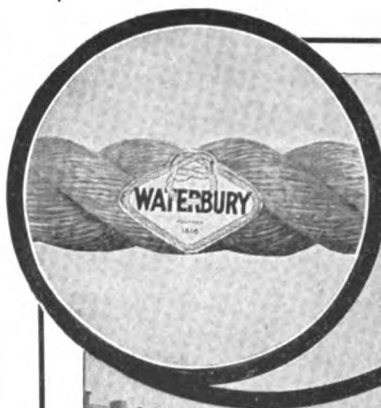
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If interested in saving weight and fuel, and in the greater simplicity and lower first cost of geared turbines for ship propulsion, write us, giving particulars of the proposed boat so that we may supply full information.

We are prepared to furnish marine steam turbines and gears in any capacity and for any steam conditions.

DE LAVAL
Steam Turbine Co.
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NEXT to actual experience with it in service, the best evidence of its superiority is the constantly increasing demand for our product. In buying Waterbury Cordage as well as other Waterbury Products, you are assured of as high a quality as it is possible to make.

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PENTON BUILDING
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"Known throughout the Maritime World."

The McNab Direction Indicators

(Gold Medal and Diploma Awards) indicate every movement and record the engine revolutions on the bridge. Thousands installed and specified for installation on 90% of steam vessels building in this country.

NO STEAMER COMPLETE WITHOUT IT.

The Willett-Bruce S. S. Whistle Control

The only control adopted by all Trans-Atlantic and other Lines; large number of installations on order and installed in this country.

An automatic fog signal assured, and a dry, clear, crisp, penetrating blast guaranteed.

The McNab Pneumatic Engine Counter

Connect it up by a pipe and install it on your steam gauge board; do away with your constant clattering rods and small gear; it is a "revolution in counters."

The McNab "Cascade" Boiler Circulator and Fuel Economizer

Hundreds installed; a practical Circulator that does circulate and economize.

Write for a full set of our books.

THE McNAB COMPANY, Bridgeport, Conn.

or

EDW. P. FARLEY, 1501 Railway Exchange Bldg., Chicago, Ill.
D. E. FORD, 465 California St., San Francisco, Cal.
M. M. DRAKE, 17 Battery Place, N. Y. City.

Eckliff Automatic Boiler Circulators

"Watch the Thermometer"

Can Your Repair Expense Stand A Reduction?

Isn't the item of Repair Expense on your Scotch boilers one that you would be glad to reduce?

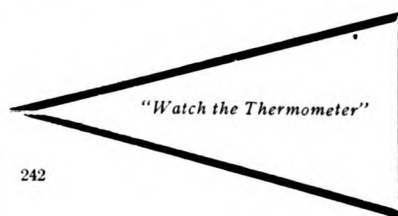
Well, the surest way to cut it to the minimum is to get circulation and equalization of temperatures of the water in your boilers.

Eckliff Circulators create perfect circulation and equalized temperatures—and that means the elimination of pitting, grooving, furrowing, corrosion, leaky seams, breaking stay bolts and other conditions that are now helping to make your Repair Expense too high.

Why not reduce that Repair item? Eckliff results are guaranteed. Get the booklet.

WRITE TODAY FOR DATA AND BOOKLET

Eckliff Automatic Boiler Circulator Company
DETROIT 54 Shelby Street MICHIGAN



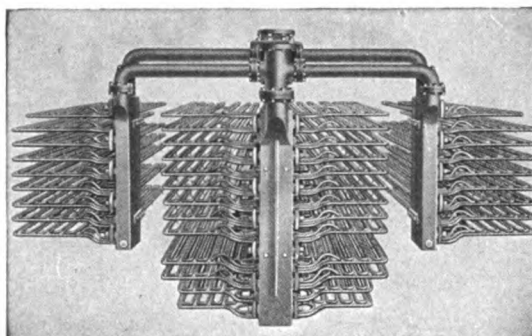
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Create and
Maintain
Perfect
Circulation

FIRE TUBE MARINE SUPERHEATER

EIGHT REASONS WHY

1. It is adaptable to either new or existing boilers of the fire tube type and can be applied with no change in design or construction.
2. It renders possible an increase in output of boiler horse power from a given boiler plant, 10% to 20%.
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4. It reduces the size of the bunkers, thereby reducing the draft of the vessel with a given cargo or making possible an increase in revenue cargo.



5. It results in a saving of fuel over saturated plants, both operating under the same draft conditions, of 10% to 20%.
6. It reduces the maintenance costs by the prevention of water hammer, leaky flanges and condensation in the cylinders.
7. It does not prevent rapid, thorough and frequent cleaning of the tubes.
8. Its construction provides easy access to all screwed joints and the easy removal of the parts.

LOCOMOTIVE SUPERHEATER COMPANY

30 Church Street, NEW YORK, N. Y.

Peoples Gas Bldg., CHICAGO, ILL.

Have You Read the Classified Advertisements?

Real bargains in Passenger and Freight Boats, Dredges, Tugs, Dredging Machinery, Engines, Boilers, Cranes, and other opportunities are awaiting you.

Take a Look Now—You May Find Something Interesting

702

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Father Time Inquired

"How do you explain the remarkable fact that for smokestacks, winches, anchors and all exposed metal and wood work above and below the decks **Dixon's Silica-Graphite Paint** lasts longer, and therefore costs less per year of service, than any other protective paint?"

Mother Nature Replied:

"Because **Dixon's Silica-Graphite Paint** is not a mechanical mixture of the silica and graphite. It is Nature's mixture of the flake silica-graphite, mined only by the Dixon Company at an American Mine and used by them with the highest grade of pure, boiled linseed oil for over fifty years as their unrivalled paint film. The Dixon Company performs its part. It makes no secondary grade. It grinds the flakes to great fineness so that the film will be adhesive."

Send for Booklet No. 77-B

Made in JERSEY CITY, N. J. by the
JOSEPH DIXON CRUCIBLE COMPANY



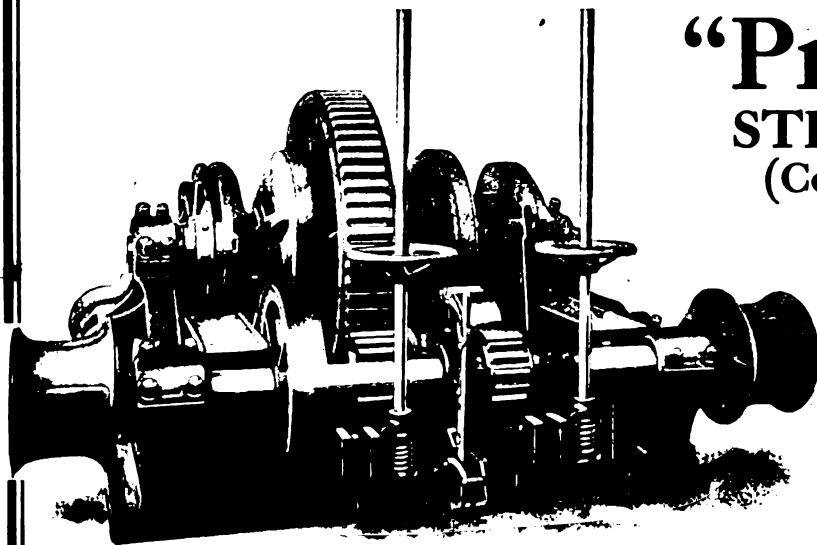
ESTABLISHED 1827



B-133

"Having a PULL means having a friend in power who will act as a steam windlass for you." The

"Providence" STEAM WINDLASS (Compound Spur Gears)



has another kind of *pull*, and plenty of it. It has 15 per cent more *pull* than the worm-gear types and at 50 per cent faster speed. You have been looking for just this combination. Our price will please you, too.

Write us today.

AMERICAN ENGINEERING COMPANY

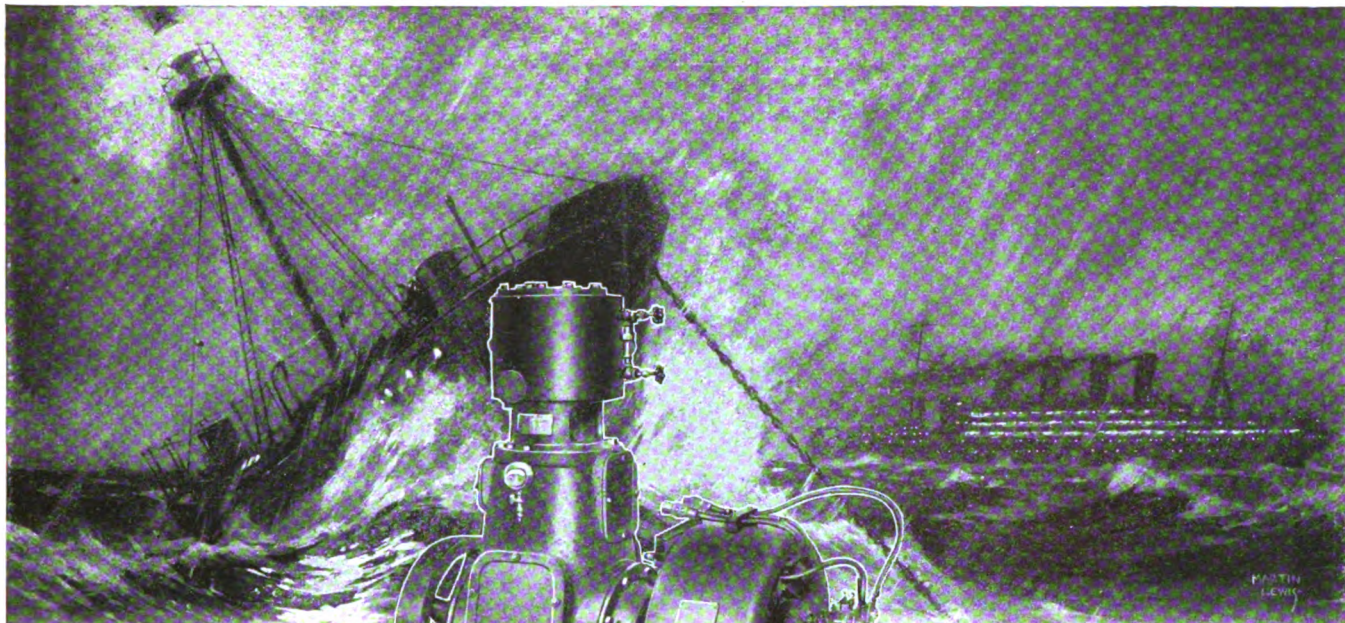
SUCCESSORS TO AMERICAN SHIP WINDLASS CO. AND WILLIAMSON BROS. CO.

MACHINISTS AND FOUNDERS

PHILADELPHIA

15-312

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Safety First

At Sea

Electricity on board ship minimizes the perils of the sea. When emergency arises, lights can be flashed on in an instant all over the boat. A searchlight also can be made to concentrate its powerful beam, wherever desired.

Put Electricity On Your Boats

It may save you thousands of dollars when emergency calls. You can install electricity on any boat. If you already have steam, enquire about a G-E engine or turbine. If steam is not available, a G-E Internal Combustion set is the most reliable and economical unit for power generation.

Let our engineers figure on the electrical equipment for your boats—**safety first at sea.**

Here is a list of G-E Products designed especially for Marine Service.

Internal Combustion Generating Sets.
Steam Engine Generators.
Turbo Generators.
MAZDA Lamps.
Arc Lamps.
Searchlights—Incandescent and Arc.
Meters and Instruments.
Wire and Cable.
Wiring Devices.
Motors.
Electric Bake Ovens and Ranges.
Electric Radiators—Tubular and Luminous.

General Electric Company

Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.
Charleston, W. Va.
Charlotte, N. C.
Chattanooga, Tenn.
Chicago, Ill.
Cincinnati, Ohio

Cleveland, Ohio
Columbus, Ohio
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General Office: Schenectady, N. Y.
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Youngstown, Ohio

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6300

Please mention THE MARINE REVIEW when writing to Advertisers



Steel Ships for Ocean Service

The good ships JOHAN MJELDE and GIJONES lifted anchor recently and sailed from the yards of the American Ship Building Company at Cleveland for far-away Norway. Also the GISLA and GAUTE and VESTLAND have sailed from our yards at Detroit and NORDAL from South Chicago. These six ships for Norwegian service are built to Lloyd's rules for ocean service and will carry approximately 3200 gross tons deadweight.



Bow of Norwegian steamer built on the Great Lakes showing part of cargo handling equipment.

Five large plants with the most modern equipment insure rapid construction

Our five complete shipbuilding plants located at Cleveland, Lorain, Detroit, South Chicago and Superior, Wis., are fully equipped to build vessels of any class for lake, ocean, sound or river service, and in addition our plants at Buffalo and Milwaukee have every facility for promptly handling repair work.

We also furnish and install all kinds of marine and stationary engines, boilers, windlasses and auxiliary machinery.

The American Ship Building Company

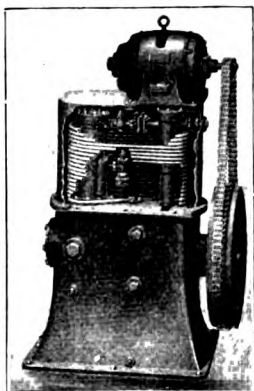
CLEVELAND, OHIO

M. E. FARR, President

O. J. FISH, Vice-President

A. G. Smith, General Manager

Please mention THE MARINE REVIEW when writing to Advertisers



SECTIONAL VIEW

PEERLESS MARINE REFRIGERATION

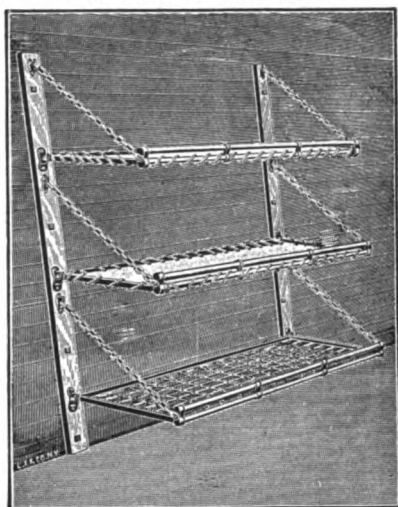
The **PEERLESS** is the most compact mechanical refrigerating machine made. **Absolutely automatic in every detail.** Oil Trap—Condenser Coils—Compressor and Liquid Receiver within one casing. All parts interchangeable—easy of access. Has highest efficiency—requires minimum space. Refrigerates—cools water—makes ice for passenger ships—freighters—yachts, private craft and all types of vessels where refrigeration is a requirement.

Let us estimate on your refrigerating plants.

PEERLESS ICE MACHINE COMPANY

72 WEST ADAMS STREET
CHICAGO

The Southern - Rome Company BALTIMORE, MD.



No. 1 ROMELINK BERTH (Open)

MANUFACTURERS OF

**Metal Berths and Bunks
of Every Description**

Illustrated Catalog upon request

SOUTHERN-ROME COMPANY

623-633 West Pratt St.
BALTIMORE, MD.



Holding the Records in the Navies of the World

The records for Economy, Capacity and Endurance in the Navies of the World, are held by

BABCOCK & WILCOX FORGED STEEL

Marine Water-Tube Boilers and Superheaters

Moreover, the same superior characteristics have been proved in the Merchant Marine.

Do you know that Babcock & Wilcox Boilers and Superheaters in one vessel are saving more than 15 per cent over Scotch boilers in sister vessels?

Isn't such a great reduction in coal bills of very great interest to you?

All essential parts of Babcock & Wilcox Boilers are heavier than the corresponding parts in Scotch boilers, thus giving greater security against corrosion.

Let us send you full details explaining why "Babcock & Wilcox" stands for **safety, ease of cleaning and simplicity of operation.**

A large portion of our business consists of "repeat-orders." You know what that means. **Write us at once.**

The Babcock & Wilcox Co.

NEW YORK and LONDON

PROVABLE FACTS—

IF you want to experiment—you won't be interested in the WAGER PATENT IMPROVED FURNACE BRIDGE WALL. BUT if you want a bridge wall that has in it five years of making good; a bridge wall that is turning the marine industry away from the antiquated fire brick; one that insures less smoke, minimum upkeep, greater efficiency and backed up by responsible references including all the leading railroad, freight and passenger steamer companies, private yacht owners, stationary plants and others—you WILL be interested in the WAGER BRIDGE.

This isn't argument, or persuasion, or contention. It's just simple, provable facts. May we prove these facts to you?

ROBERT H. WAGER

FURNACE BRIDGE WALLS

New York

Philadelphia

Detroit

New York Office: Singer Building

Telephone: Cortlandt 4299



ELECTRIC WHISTLE OPERATOR

The simplicity of installation is one of the many advantages over all other electrically controlled Whistle Valves; saves time, material, weight, maintenance and cost.

Eliminating instruments and wiring in wheelhouse.

Eliminating the use of Electric Motors for operating.

Electric Control Co.

161 Washington St.
NEW YORK

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This directory is maintained for the benefit of vessel owners and operators who occasionally require the counsel and service of experienced Admiralty Proctors.

ALBERT J. GILCHRIST

PROCTOR IN ADMIRALTY

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Proctors in Admiralty, General Practitioners
and Commercial Collections
Business Address, GRAND HAVEN, MICHIGAN

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CLEVELAND, O.

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DAVIDSON & HUDSON

ATTORNEYS AT LAW

Proctors in Admiralty

Sault Ste. Marie - - - Michigan

Do you handle Admiralty cases?

Yes?

Why not do a little talking — you can handle more? You have a vast field of prospects, BUT, what are you doing to introduce yourself to them?

618

HARTSHORNE, INSLEY & LEAKE

COUNSELLORS-AT-LAW

239 Washington St., JERSEY CITY, N. J.

Presenting your professional card to several thousand vessel owners in a vessel owners' paper is no more unethical than presenting one card to one vessel owner in his own office.

619

Please mention THE MARINE REVIEW when writing to Advertisers



"It's the Ideal Ladder," says the Captain

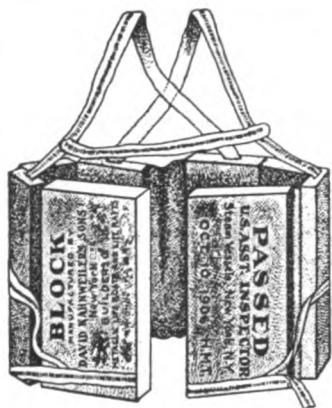
The McArthur Jacob's Ladder shown here is on one of the largest vessels plying the Lakes. This ladder embraces several new features in ship ladder construction that make it ideal for all around marine use. It satisfactorily meets every requirement because it has no undesirable features that many ladders have—particularly the rope ladder. It is made in sections of any desired length. These sections can be instantly connected by snap hooks thus adapting the ladder to light or loaded conditions of ships. The telescopic feature of the former type is eliminated. It is easily rolled up, is light but extremely strong and hugs to the side of the ship so firmly as to make its use safe and easy. 118 of the leading fleets on the lakes use these ladders and several Transatlantic steamers are fully equipped with them.

Equip your vessel with the McArthur Jacob's Ladder.

Write for complete detailed information.

The McArthur Portable Fire Escape Co. CLEVELAND, O.

The McArthur Jacob's Ladder is patented and all infringements on it will be prosecuted.

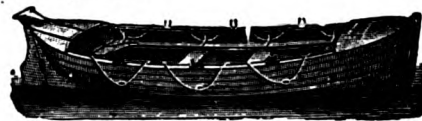


Solid Block Cork Life Preservers

Warranted 24 pounds. Buoyancy and full weight of Cork and Workmanship as required by U. S. Inspectors.

SAFEST CHEAPEST
SOLID CORK LIFE PRESERVERS
RING BUOYS AND FENDERS

Approved and adopted by U. S. Board of Supervising Inspectors. Also adopted by the principal Ocean, Lake and River Steamer Lines as the only Reliable Life Preserver. Awarded four Medals by World's Columbian Exposition.



METALLIC AND WOODEN LIFE BOATS
METALLIC LIFE RAFT
MARINE DRAGS LYLE GUNS

WICKS' PATENT RELEASING BLOCKS FOR LIFE BOATS

DAVID KAHNWEILER'S SONS

260 FRONT ST., COR. DOVER ST.

NEW YORK CITY



Lifeboats, Rafts, Davits

Famous for their QUALITY and ECONOMY

CATALOG ON REQUEST

WELIN MARINE EQUIPMENT CO.

305 Vernon Avenue

LONG ISLAND CITY, N. Y.



ANDREW J. MORSE & SON, Inc.

221 High Street

BOSTON, MASS.

ESTABLISHED 1837

Diving Apparatus and Submarine Armor
Fire Department Supplies
The Morse Monitor Nozzle

LIFE PRESERVERS

Cork Cushions, Fenders, Cork Ring Buoys

"Ye Oldest Cork House in America"

ESTABLISHED 1865

JUSTUS BRAUER & SON

129 Arch Street

Incorporated

Philadelphia, Pa.

LANE LIFE BOATS

C.M. LANE LIFE BOAT CO.



250 HURON ST.

BROOKLYN, N.Y.

LAST LONGEST



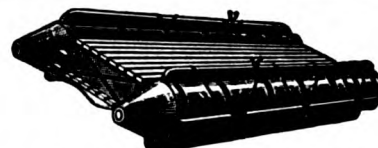
THOS. DREIN & SON COMPANY

Established 1866

WILMINGTON, DEL.

Sole Builders of the

Patent Beaded Bottom Metallic Life Boats, Life Rafts and
Wooden Boats of all classes.



Outfits for Lake Steamers a Specialty

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This page is conducted for the vessel agent and insurance agent who has a real service to offer the vessel owner and operator.

John J. Boland

Adam E. Cornelius

BOLAND & CORNELIUS

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1204 Prudential Building,
BUFFALO, N. Y.W. C. Richardson
John T. KellyClarence E. Richardson
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Residence } W. C. Richardson, Doan 404

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Co-Operative Grain Trimmers

Fort William, Ontario

Let us Trim your Steamers
We know how

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Cleveland

VANCE & JOYS CO.

VESSEL AND INSURANCE AGENTS

1004-1006 First National Bank Building

TELEPHONE MAIN 3907

MILWAUKEE, WIS.

"There may be some men who believe that because they have been in business in **** all their lives that they do not need to advertise. They are like the fellow wearing blue goggles who winked at a girl. He knew he was winking, but she didn't. Just so, if a man does not advertise he may know he is in business, but the public is likely to be unaware of it."

622

When a man reads *The Marine Review* he is thinking of things Marine. If you approach him at such a time he'll remember what you tell him.

625

The time for you to talk] to the vessel owner about your services is when his mind is free from the cares of the day.

623

One of these cards concerning your business is like a snowball rolling down hill. The longer it "rolls" the more powerful it becomes.

626

You'll find the vessel owner's mind free from the cares of the day when he is reading his favorite marine paper—the *Marine Review*. That's the time for you to do your talking.

624

A vessel owner will place more confidence in your business if he learns of it thru the paper that has kept him informed on marine subjects for years than if he learns of it anywhere else.

627

Please mention THE MARINE REVIEW when writing to Advertisers

PROPELLER DESIGNS METHOD **DYSON** SUPERVISION

"USED BY THOSE WHO KNOW"

WRITE FOR LIST OF USERS AND
OUR INTERESTING LITERATURE

AMERICAN SCREW PROPELLER CO.

1520 Sansom Street, PHILADELPHIA, PA.

Consulting Engineers

Captain C. W. Dyson
Luther D. Lovekin, M. E.

Director

Raymond E. Lovekin

Equip your boiler with a reliable
VANDUZEN
Patent Vertical Water Gauge
Commended by Steam Boiler Inspectors.
Used extensively on most large River
Steamers, in Water Works and Stationary
Engine Boilers.
Simple in construction, durable
and reliable in operation.



The dials are large and easily read.
Reliability and effectiveness guaranteed.

THE E. W. VANDUZEN CO.
428-434 E. Second St. Cincinnati, O.

Reilly Marine Specialties

Feed Water Heaters
Fuel Oil Heaters
Grease Extractors

Evaporators
Distillers
Filters, etc.

Built in accordance with U. S. Steamboat Inspection and Lloyd's Rules.

Write for Bulletins.

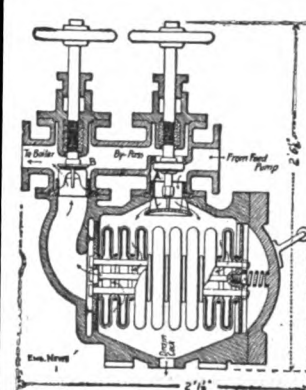


The Griscom-Russell Co.

Successor to The Griscom-Spencer Co. and
The James Reilly Repair & Supply Co.

2121 West St. Bldg., New York

OUR
**Feed-Water
Filters**



will keep oil out of
your boiler

They Have No Equal

Write for list of users

Ross Valve Mfg. Co.
Troy, N. Y.

The Barton Steam Trap

For General Use on Steamboats



Listing of ship does not affect its operation. It cannot freeze or become air bound. Keeps pipe lines free from condensation, thereby insuring your cargo. Makes the heaters heat. Does away with cylinder cocks on deck engines. Does its work regardless of temperature. More than 1,000 in successful operation on lake boats. Barton traps are dividend makers. A Barton trap installed on trial will answer the question of economy. Barton traps used on 150 boats on the lakes. (Used on steering, deck engines, forward auxiliary lines, forward main exhaust lines, after radiator lines, hot water tanks, in fact any place where a steam trap can be used the Barton trap is successfully operated.) When in Cleveland call Harvard 1532 and learn more about it.

JOHN W. BARTON

Owner of

Barton Steam Trap Co., 2707 Vestry Ave., Cleveland, O.
Formerly of Automatic Steam Trap Specialty Co., Detroit.

Lake Shipyard Methods of Steel Ship Construction

By **ROBERT CURR.**

It shows, step by step, how to build a vessel from the mold loft floor, the cheapest method of construction. Every piece of plate and shape is taken up and the method of laying off clearly explained. The book is copiously illustrated with hundreds of line drawings and numerous photographs and affords in itself, a liberal education in the art of ship building as practiced on the Great Lakes. \$2.00 postpaid to any address.

Penton's Book News, - **Cleveland, Ohio**

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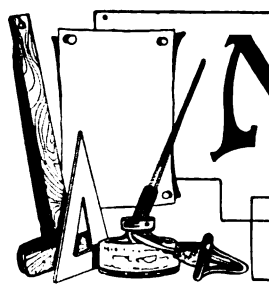
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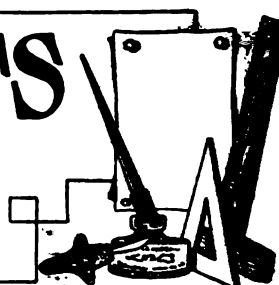
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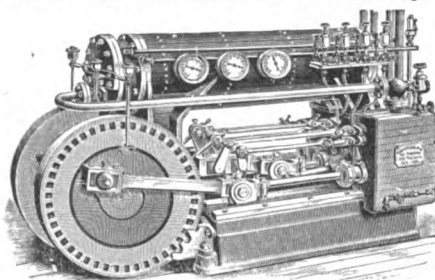
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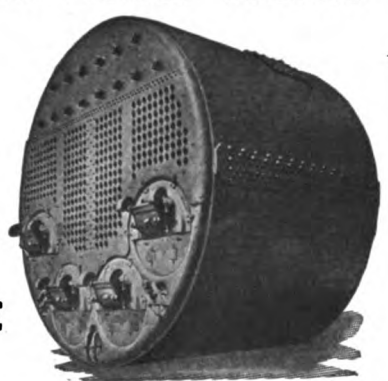
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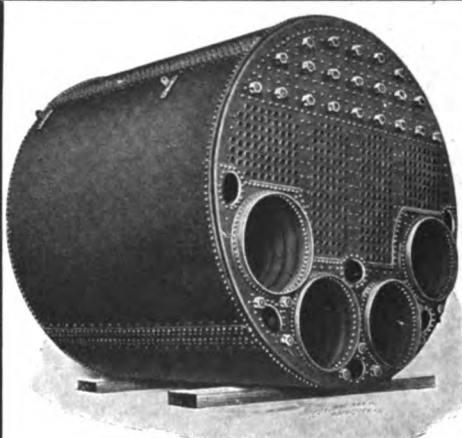
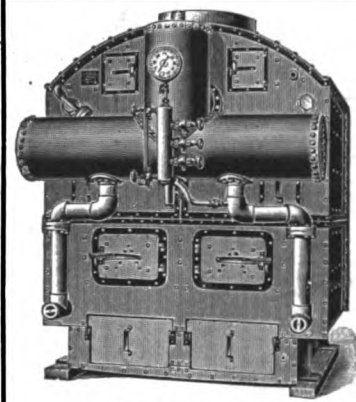
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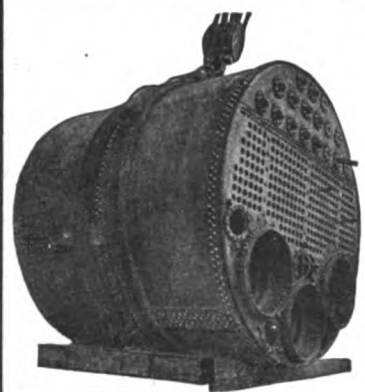
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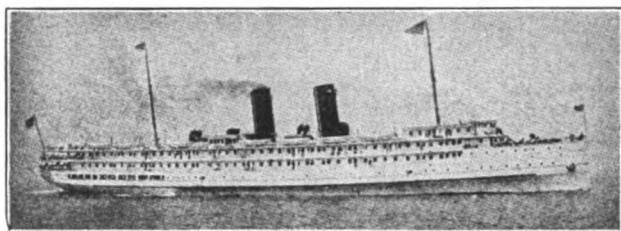
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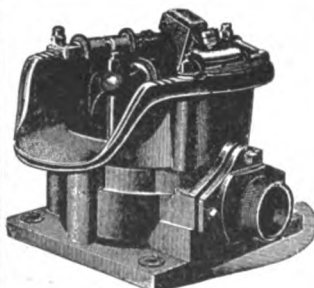
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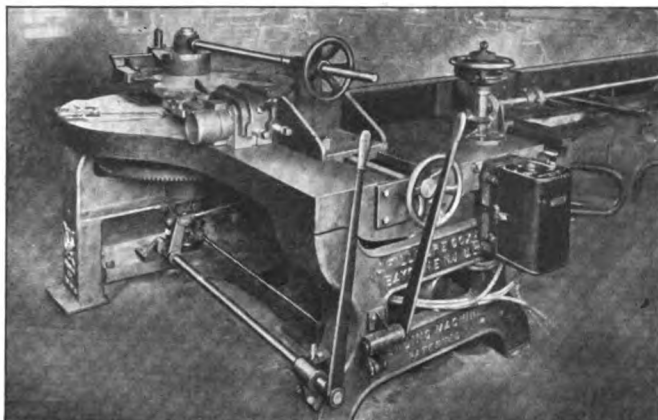
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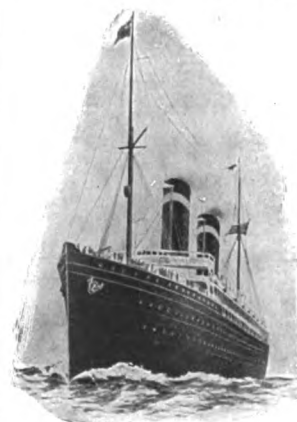
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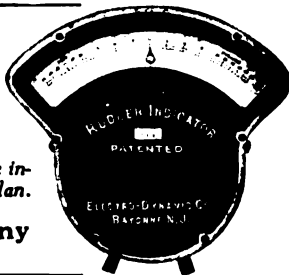
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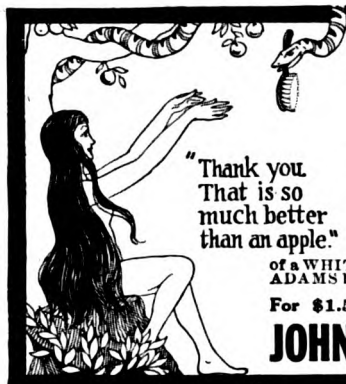
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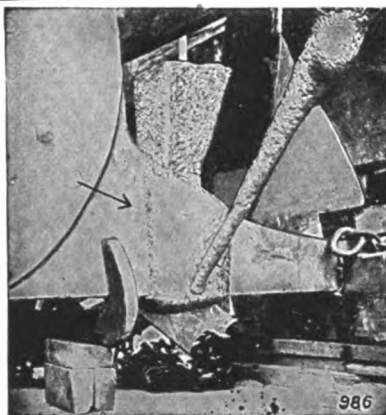
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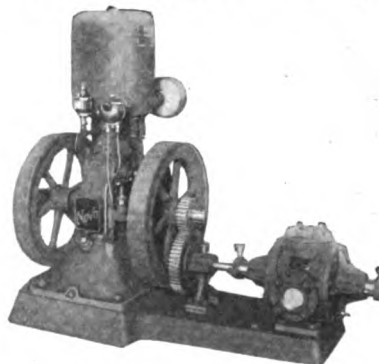


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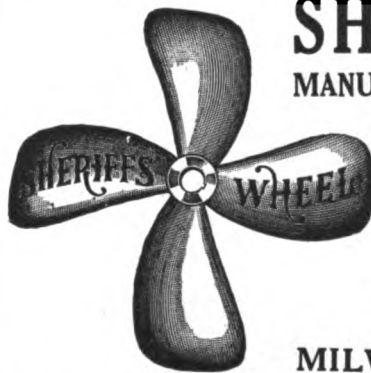
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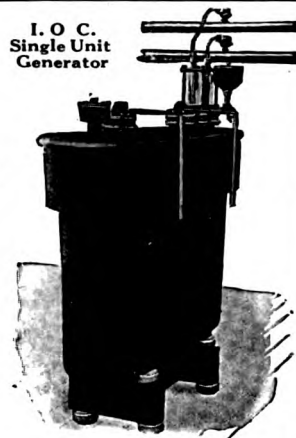
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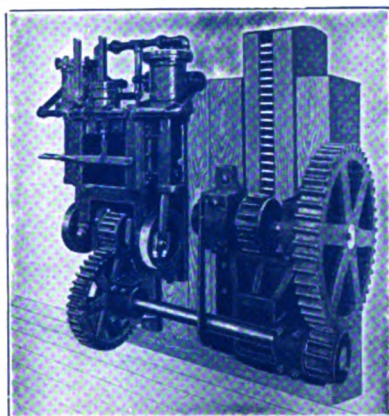
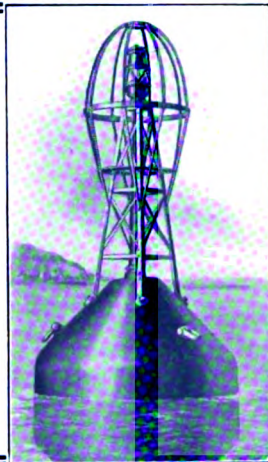
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Double 6" x 6", 7" x 9" and 9" x 10" Throttle Reverse Engines

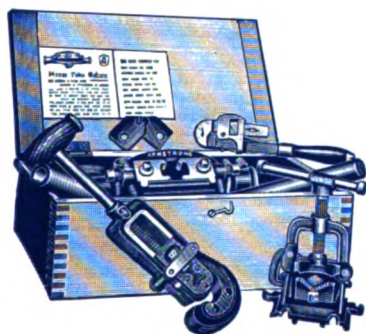
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We build the engines with either throttle or link reverse, as well as non-reversible and for a great many purposes.

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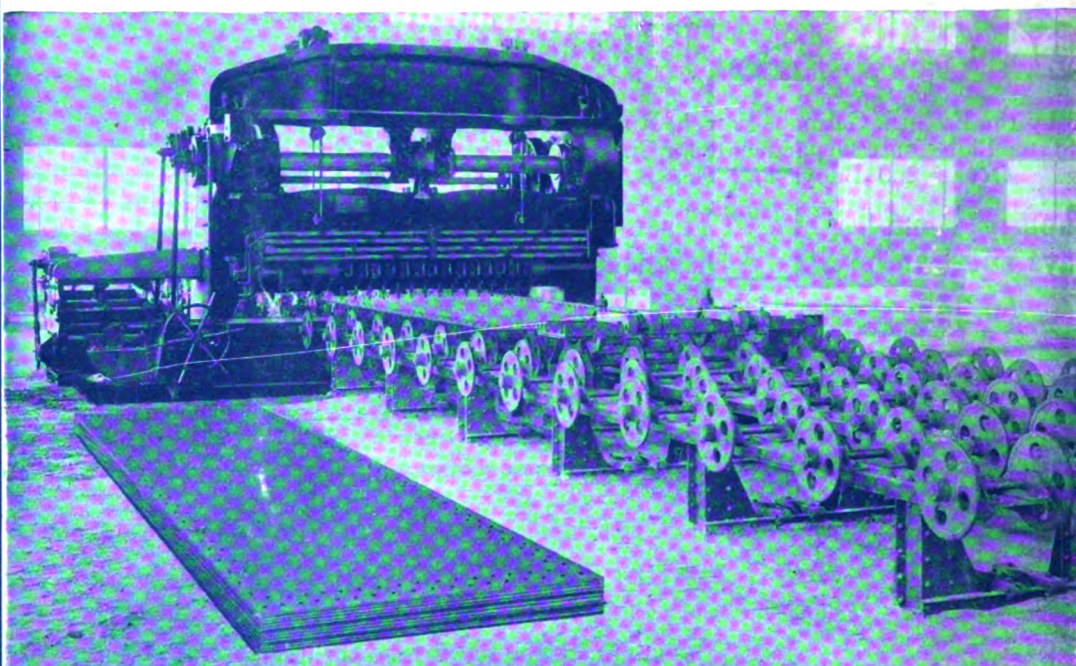
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